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A USAF F-15EX Eagle II, from the 40th Flight Test Squadron at Eglin Air Force Base, Florida, undergoing developmental and operational tests over the Gulf of Mexico on September 16, 2025. USAF photo by Staff Sgt Blake Wiles

Introduction

It's amazing to think that – almost 55 years since its first flight – the McDonnell Douglas/Boeing F-15 Eagle is still in production and serving a number of air forces around the globe.

And that number of air forces could well be growing, thanks to the new-build and thoroughly modern 'second generation' of the mighty Eagle: the F-15EX Eagle II.

Now coming into service with the USAF to replace elderly F-15Cs in Air National Guard and USAF units, the Eagle II is an up-engined, fly-by-wire modern reboot of the very successful F-15 airframe. It's hoped more than 140 will be purchased for the USAF and that this will see future export orders come in on top of 'Advanced Eagle' orders from Saudi Arabia, Qatar and Israel.

The F-15 was originally born during the Cold War, being developed in the mid-1960s as a successor to the multirole, two-seat F-4 Phantom II.

Initially intended as a pure air-to-air interceptor and air superiority fighter, the hard-won lessons of the Vietnam air war were baked into its design. The F-15 housed a single pilot under a blown 'bubble' canopy for an unobstructed view in front, above and behind. It also packed a high-tech missile armament into a highly agile airframe that boasted a capable look-down/shoot-down radar, two lightweight yet extremely powerful F100 turbofan engines and that all-important gun for close-in dogfighting.

With a high price tag, only a select few nations could afford or were allowed to purchase the Eagle, but it was soon in action with the Israeli air force where it made its first kill in 1979. The total is now thought to be anywhere between 104-109...

The type's latent air-to-ground capability was later harnessed in the F-15E 'Strike Eagle' during the late 1980s, ushering in a

new era of accuracy and survivability for aircrew in that demanding role. The USAF's fighter and strike versions of the F-15 made their combat debut in the 1991 Gulf War. Since then, the F-15E has matured into one of the world's most capable strike aircraft serving with air forces across the globe, including Israel, the Republic of Korea, Saudi Arabia and Singapore.

Despite the introduction of the F-22A Raptor in 2005, the F-15C Eagle has held the line, being the most numerous air superiority fighter in the USAF's arsenal, but the F-15EX Eagle II can't come soon enough. Many 'albino' Eagles have had more than 35 years of high-G use and they are getting tired.

The new-build Eagle II offers a generational leap over the legacy F-15s in service; it seems there's life in the old bird yet...

Bertie Simmonds

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AIR POWER

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Old and new: A McDonnell Douglas F-4E leads an early F-15A. The F-4 was originally designed as a fleet interceptor, before becoming a fighter-bomber, recce aircraft and 'Wild Weasel' SAM killer... It would be some years before the Eagle's latent air-to-ground capability was unleashed.

Fledgling fighter

Fashioned at the Pentagon following the unveiling of contemporary Soviet designs and honed by the battles over Vietnam, the F-15 Eagle was to become a no-holds barred air-to-air fighter, but it was a long road to that first flight...

Many different outside forces were acting on the United States of America's military procurement machine in the decade before the F-15 Eagle's entry into service.

Firstly, the cost of development and procurement of high-profile weapons systems had been under close scrutiny since the early days of the Kennedy presidency in the early 1960s: John F.

Kennedy took office in January 1961, bringing with him Robert Strange McNamara.

McNamara's background was business school before he became a captain in the United States Army Air Force in 1943. His work during the conflict was in the Office of Statistical Control, basically increasing the effectiveness and efficiency of bombers during the late war period (getting them to sometimes double as transport aircraft) in

the Far Eastern theatre of war.

Connections made during wartime helped McNamara get a job with the Ford Motor Company in 1946. This job led to McNamara and nine others initially being called the 'Quiz Kids' for all the questions they asked of the old hands on the shop floor and above as well as their comparative youth to that of the Ford board. Soon this was changed to the 'Whiz Kids' and they – led by McNamara – basically restructured



This telling shot shows the various sizes of the F-4 Phantom (in British FGR.2 form), McNamara's TFX, which became the General Dynamics F-111, the F-15 Eagle and the French Dassault Mirage, seen here in Belgian colours.

Ford and also looked at what products it made. At the end of 1960, McNamara became the first president of the Ford Motor Company who wasn't a member of the Ford family.

But bigger things lay ahead. Within a month of taking up the job at Ford, JFK had offered McNamara a range of jobs in his administration – he chose defence – and his job was to ensure that the Kennedy administration got the best value possible for the defence dollar.

One way of doing that was to have some sort of commonality between the services and so in September 1961 it was decided that an aircraft would be developed to fulfil both the Air Force's tactical fighter role and the Navy's fleet defence role. What came from this idea was the Tactical Fighter Experimental programme (TFX) but – despite the logical concept of a common airframe to keep costs down – the conflicting needs of both the tactical role and that of a fleet interceptor seemed insurmountable: at least in the heads of USAF generals and USN admirals. And this was before designs were even submitted let alone metal cut...

The winner of the TFX competition was announced at the end of 1962 as General Dynamics, operating out of Fort Worth, Texas. The aircraft designed and built for these roles was to become the F-111. In USAF guise it would be a variable-geometry (or 'swing wing') nuclear and conventional interdictor while (with Grumman's help)

the F-111B would be a long-legged fleet interceptor, armed with a new breed of ultra-long range air-to-air missiles.

Cutting a long and painful story short, during sea trials it was found that the F-111 was too big and too heavy to be a fighter or interceptor of any real use to the Navy. Their variant had first flown in 1965 and a series of development issues – including with the Pratt & Whitney TF-30 engines and fatal crashes – marred the programme. Also, the costs had tripled. Little wonder deck crews had nicknamed it the 'Sea Pig'.

The F-111B project for the Navy was finally killed in 1968 when – during a congressional hearing concerning the project Admiral Tom Connolly made his famous statement: "There is not enough thrust in all Christendom to put that airplane back in business really. It has gotten awfully expensive. It has gone way up in cost, and I think we ought to consider very carefully using the Navy money and the country's money in a better way."

Around \$400 million had been spent on the F-111B alone but thankfully the engines and weapon systems were used as the basis for the US Navy's F-14 Tomcat while the USAF's F-111 variants (FB-111A, F-111A, D, E, F and EF-111 Raven 'Spark Varks') served the US well into the 1990s with the Royal Australian Air Force buying the F-111C version, which served until 2010.

This turn of events with the Navy's F-111 and the maturing USAF version initially didn't look good for the government



Robert Strange McNamara had a background in business and is still the USA's longest-serving Secretary of Defense.

of the day or General Dynamics. While the strike-fighter version would mature into a fine aircraft, the first combat deployment in 1968 was perhaps too much too soon for this innovative aircraft. Three from the original six deployed were lost within the first month, due to issues with their horizontal stabilisers, rather than enemy action. It would be another three ➤



The Vought A-7 proved to be a great aircraft in both US Navy and USAF service.

years before the F-111 was declared fully operational and – as fine an aircraft as it became – it was also hampered by its original ‘Jack-of-all-trades’ design and, while it was capable as a nuclear armed strike-fighter, initially a ‘conventionally armed’ F-111 with a full load of Mk.82 iron bombs wasn’t capable of flying higher than around 16,000ft. This – alongside improvements in Soviet surface-to-air (SAM) missile systems – led to the F-111 becoming a low-level strike aircraft.

By now McNamara was gone to a new job at the World Bank. His legacies included that of being (still) the longest-serving Secretary of Defense, serving from 1961 until 1968 under both Kennedy and his successor Lyndon Johnson. Another legacy that lived on after he’d gone was the culture he fostered of attempting to keep costs down: sometimes this bore fruit, such as when he made the USAF employ the Navy’s F-4 Phantom II and during the UN Navy’s search for a Douglas A-4 Skyhawk replacement.

The request for Skyhawk replacement proposals required that they be based on an existing airframe. Strangely (and cheekily) the Vought team put forward the A-7 Corsair II, which any plane-spotter could see only shared the basic shape of the F-8 Crusader and very few common parts! Following the Navy’s successful debut of the A-7A into combat over Vietnam in 1967, the USAF quickly adopted its own version – the A-7D – for its own tactical role over South-East Asia, more on which below...

Lessons from previous wars and Vietnam

The lessons re-learned in the skies over Vietnam were hard-earned. Just before the conflict, the USAF was expecting to have a general ‘mix’ of F-111s and F-4s for the 1960s and beyond. In 1963 ‘Project Forecast’ was a paper which set out to identify future requirements for the USAF. In it, General Bernard A. Schriever of Air Force Systems Command said that fighter needs in the 1970s would be best met by F-111 and F-4 variants *“optimised for the air-superiority role... and that strategic bombing from aircraft able to fly higher and faster than the enemy would ensure air superiority.”* Project Forecast added: *“...the counter-air force must be able to destroy aircraft in the air.”* So, any inbound attackers had to either defend themselves or have the appropriate cover.

Around a year later in 1964, Major General Arthur C. Agan was becoming frustrated that many in the Pentagon believed dogfighting and the use of guns on aircraft was an anachronism; as a former P-38 Lightning pilot in the Second World War, Agan didn’t think this was the case and argued the case in favour of keeping guns as a fighter weapon. In the autumn of 1964, he presided over a committee of former fighter pilots to look at the USAF’s then-current tactical capabilities.

It was hoped that at the very least they could use the findings to push the case for an internal gun in any future version of the USAF’s F-4C. The committee was eventually

chaired by Brigadier General Harrison Thyng (Second World War and Korean War ace), Colonel Francis ‘Gabby’ Gabreski (also an ace in both those conflicts), Brigadier General William Douglas Dunham (a triple ace in the Second World War) and other former air-to-air veterans.

Understandably, this group of famous old fighter jocks came to the conclusion that a new fighter should be developed to counter the Soviet’s increasing capability in this area. By this time it was known that more modern versions of the MiG-21 were in development, much more advanced than the early models which were based on the basic airframe which first flew in 1956.

Initially the group’s findings fell on deaf ears, but in early 1965 the incoming Chief of Staff – General John P. McConnell – urged Agan to draft a statement on tactical air superiority. This was finally circulated all across the USAF’s chain of command in May 1965 – just as combat operations over Vietnam had begun...

While this was happening, Lieutenant Colonel John W. Bohn Jr. had been tasked – since the previous August – to produce a study entitled: ‘Force Options for Tactical Air’. This report critically assessed the USAF’s reliance on high-performance tactical fighters to provide: *“...the greatest flexibility at the lowest cost.”* Things were starting to come to a head, as – around the same time – it was becoming obvious that the TFX/F-111 was purely a strike aircraft and when this became clear, some of the top brass – convinced by Bohn’s findings

when the study was completed at the end of February 1965 – wanted to move to a ‘high-low’ mix of low-cost fighter-bombers with expensive, more capable ones.

The low-cost elements were a way of strengthening the USAF by sheer weight of numbers. Many different versions of various existing aircraft were looked at, including the F-4, the Douglas A-1 Skyraider, Grumman A-6 Intruder and F-104 Starfighter – although by now it was accepted that the Starfighter was nothing other than an export success rather than a tactical USAF one.

Eventually this ‘low’ mix came down to two designs. The first was initially going to be a higher-specification version of Northrop’s F-5, which was proving popular in the export market, while the other was to be a land-based version of the Vought A-7 Corsair II, which – while not as effective as the agile F-5 in the fighter role – could carry a much higher payload and was already proving its worth in the US Navy as an accurate strike aircraft.

Arguments went to and fro as to what aircraft would best fit the bill – and other arguments came about as to what future ‘premier’ fighter could guarantee the survival of any new aircraft. As was often the case, yet another Air Staff study was made – under the direction of Colonel Bruce Hinton (a former Korean War ace) looking at a future ‘Tactical Fighter Ground Attack Aircraft’. This ended in 1965 with the A-7 Corsair II as overall winner. History would show that the F-5 would be employed in the aggressor/adversary role for the USAF, while the A-7 would go on to have a long and fruitful USAF career, coming into use in 1970 and departing the last Air National Guard units to operate it in 1993.

These studies and counter-studies, arguments and counter arguments showed the way the system was in the United States and in the Pentagon during the 1960s: confusing, to say the least. What ultimately was decided from these studies was that the more capable, more expensive fighter

Irving ‘Irv’ Burrows



Irv Burrows: not only the first man to fly the F-15 Eagle, but he was an eager observer ‘online’ during the first flight of the ‘new’ F-15EX Eagle II in March 2021...

project pilot for the F-15 Eagle programme.

Irv has many awards to his name, including the Ivan C. Kincheloe trophy by the Society of Experimental Test Pilots as ‘Test Pilot of the Year’ for his work on F-15 programme (1974) he was made a fellow in the Society of Experimental Pilots in 1972 and served as its president in 1977. In 1989, the society presented him with the James H. Doolittle Award while in 1984 he received the USAF Test Pilot School Distinguished Alumni Award in recognition of his work in flight test.

He retired from test flying in 1976 then held several positions at McDonnell eventually serving as executive vice president. Burrows continued to fly recreationally for a number of years after retiring from test flying and he retired from McDonnell in 1991.

Burrows initially served in the United States Navy, began his flying career as a teenager and served in the Korean War.

In 1950 he was selected to begin training as a pilot in the USAF, graduating at the top of his class. Initially training to pilot the P-51 (by now called F-51) he was retrained and flew the Lockheed F-80 Shooting Star and made reconnaissance flights in the North American RF-86 Sabre in Korea. He earned the Distinguished Flying Cross and two Air Medals after flying more than 100 combat missions. On leaving the Air Force he was employed at McDonnell Aircraft Company, joining the flight test department and attending the USAF Test Pilot School at Edwards Air Force Base in 1958 – the very year of the F-4 Phantom II’s first flight.

Subsequently, Irv flew diverse McDonnell types including the F-4, F-101 Voodoo and F-3H Demon before his crowning glory – being selected as

was to be labelled F-X and this was to become the F-15, although even then the specification of the aircraft was to change this way and that as the arguments ebbed and flowed.

Initially it was going to be a multirole aircraft, then a pure fighter; also the size/

weight of the aircraft would change. Meanwhile, the air war over Vietnam was showing a real need for a pure air superiority aircraft. On April 4, 1965, two bomb-laden Republic F-105 Thunderchiefs were shot down by supposedly ‘obsolete’ Korean War vintage MiG-15s.

So – as the decade wore on – both the USAF and US Navy would find themselves equipped largely with a fast, powerful but none-too agile interceptor, equipped solely with air-to-air missiles (F-4 C/D and B/J Phantom IIs) which were expected not only to execute the strike/attack role, but also dogfight with smaller, more nimble gun-toting MiG-17s, -19s and -21s. Meanwhile the fighter-bombers were even harder pressed – especially in the face of localised fighter opposition when they flew without escort.

Soviet supremacy?

The ‘West’ had felt that its military aircraft had the edge on anything designed by the Soviet Union, probably since the Spanish Civil War of the 1930s. There, in clashes in the skies above, rotund Polikarpov I-16 ‘Ratas’ of the Republicans would take on the sleek Messerschmitt Bf 109s of the Nationalists.

However, this well-known image is not a particularly good reflection of the ➤



By the late 1960s, the revelation of new Soviet high-speed interceptors such as the Su-15, MiG-23 and (seen here) MiG-25 gave the F-X programme greater impetus.

reality. The Polikarpov I-16 itself featured some modern touches for an aircraft that first flew in 1933 (monoplane, retractable undercarriage) and this pointed the way to more advanced designs from the Soviets as years went by. Indeed, German comparative tests showed that the I-16 outperformed the Bf 109 at low altitude.

By the time the Nazi advance had ground to a halt following Operation Barbarossa, Soviet aviation technology was moving forward swiftly and mid to late war designs such as the later Yaks and LaGGs were at least the equal of anything from the West – at lower altitudes.

In the Korean War, the Soviets shocked the world with the debut of the swept-wing MiG-15 in combat and from then on until the late 1970s the Mikoyan-Gurevich design bureau was in the ascendancy.

The MiG-21 'Fishbed' first flew in 1956, but it was advanced versions of this aircraft that were beginning to worry both the USAF and the Pentagon in the early 1960s. With current versions of the F-4 Phantom II finding it sometimes hard going against the Fishbed-Cs of the North Vietnamese Air Force, the next MiG-21 – the PF – which stood for *Perekhvatchik Forsirovannyi* (Interceptor Uprated) was already flying in Russia. This second generation of Fishbed had enhanced avionics and sensors, radar-guided air-to-air missiles and uprated Tumansky R-11 F2-300 turbojets. Worse, MiG was already developing a version of this model, the MiG-21PFL for use solely by the Vietnamese. As superbly flown as the existing F-4C and D models of Phantom II were over Vietnam, any qualitative edge the Americans may have had in general over the Soviet-built fighters was being eroded.

In 1967 the Western world was shocked by the first sight of a number of new Soviet fighter aircraft. At the Domodedovo air pageant of July 1967, both the MiG-23 and MiG-25 made their debut alongside the Su-15 Flagon interceptor and Su-17 Fitter attack aircraft. The West saw that the MiG-23 followed the likes of the F-111 by employing a 'swing' wing to handle the differing needs of slow speed for landing and dogfighting and high-speed for the intercept role.

The MiG-23 was a single engine aircraft while the MiG-25 used two, huge Tumansky R-15 turbojets, giving a maximum *theoretical* speed of Mach 3.2. The MiG-23 was named 'Flogger' under US/NATO coding while the MiG-25 was christened 'Foxbat'.

As was usual back then, the knee-jerk reaction was to overplay the projected performance of these fighters: besides, this was good for defence spending! The Foxbat was actually a Soviet response to the North American B-70 Valkyrie – a Mach 3 bomber – which was cancelled in 1961 but still flying in the mid-1960s as the XB-70 test-bed. And, although it did reach Mach 3.08, it never routinely flew above Mach 2.5.

At first, US intelligence considered that both these new MiG types were probably handy air combat dogfighters – history has

since proven otherwise – especially after the defection of Viktor Belenko, who flew his MiG-25 to Japan in 1976 – but it did add some impetus to the F-X programme. The original specifications for this were now being drawn up and – to act as a catch-all to any future MiG/Soviet design, it was decreed that the F-X would have a "25% superiority over the MiG-21".

Enter the 'mafia'

At the end of 1965 the USAF sent RFPs (Requests for Proposals) to 13 aircraft manufacturers for initial studies, resulting in 500 different designs. By now the F-X was set to become a large aircraft in the 60,000lb (27,273kg) class, with a top speed in the region of Mach 2.7-2.9. Many of the design submissions featured the 'en vogue' variable geometry configuration. It was around this time that a group known as 'The Fighter Mafia' got involved.

Also known as 'The Lightweight Fighter Mafia' the core members were Colonel Everest Riccioni, Colonel John Boyd and civilian analyst Pierre Sprey. Others are mentioned as also being 'in the family', including Deputy Defense Secretary David Packard and General Dynamics designer Harry Hillaker.

The F-X programme that led to the F-15 Eagle saw the original specifications increase in weight and sophistication, but many inside the Pentagon were vehemently against both weight and sophistication. Sprey – a weapons systems analyst – argued for a simple machine in the 25,000lb (11,340kg) class, armed with a basic radar system, a gun and a pair of lightweight missiles, to help bolster the numbers in the USAF compared to procuring a large, complex and expensive F-X. This was initially looked on as being the F-5, then became the F-XX (or FX squared) proposal and then (ultimately) the LWF Light Weight Fighter, which finally resulted in both the General Dynamics F-16 Fighting Falcon and later the McDonnell Douglas F/A-18 Hornet.

Colonel John Boyd had a hand in both the F-16 and what would become the F-15. In October 1966 he was assigned to review the F-X studies. Boyd was a bit of a maverick. A time-served fighter pilot, he was an influential voice in the USAF's fighter community. Further still, Boyd linked up with Thomas Christie – a mathematician – to develop his quantitative theory for measuring the energy and agility of comparative fighter aircraft. Boyd was asked to overlay this theory on the specifications of the 60,000lb aircraft that the USAF was asking for.

Eventually, both Boyd and Sprey got involved with F-X and the weight of the proposed aircraft tumbled. By September 1968 there was a more refined set of specifications from the F-X SPO (Systems Program Office). They issued RFPs to eight manufacturers and just three had responded by the end of the year: Fairchild-Republic, McDonnell Douglas (McDonnell and Douglas having merged together just

the year before) and North American. Each would receive more than \$15 million for the Contract Definition Phase.

By now the F-X was defined as a single-seat, fixed (not swing) wing aircraft, featuring twin-engines and being around 40,000lb in weight (18,182kg). With both Boyd and Sprey angling for a more basic or austere F-X, they couldn't get the aircraft to be made any smaller but they could make it cheaper. Some of their thoughts led the F-X proposal to have reduced-cost avionics, ironically losing the TISEO system (Target Identification System, Electro-Optical) which later appeared as part of the F-15's FAST (Fuel and Sensor Tactical) packs system. The loss of this and some air-to-ground provisions lowered the unit cost of each F-X by around \$1 million each. This – and other reductions instigated by Deputy Defense Secretary David Packard – meant that the entire programme stayed on or below the \$1 billion limit, where the selection process could be more delicately scrutinised.

A footnote on the 'Fighter Mafia' is that when Colonel Boyd saw one of the first mock-ups of the F-15, he looked up in astonishment and gasped: "*Good grief, it's too big!*"

McDonnell Douglas wins

Three main designs had been selected for the F-X/F-15 competition as it was now named. 'Contractor C' was North American and its offering had a 46ft wingspan and a 500sq ft wing area. Internal fuel was rated at around 10,400lb with a take-off weight with four medium-range air-to-air missiles at around 39,200lb. The general design featured centrally buried engines, angled intakes and a single large fin (with dorsal fin) and a blown cockpit canopy.

'Contractor B' was Fairchild. Its design had a podded engine under each wing, a single vertical fin, bubble canopy and widely-spaced horizontal fins as a result of being attached to the engine trunks. Wing area was around 527sq ft and internal fuel 11,100lb. Take-off weight was around 39,800lb.

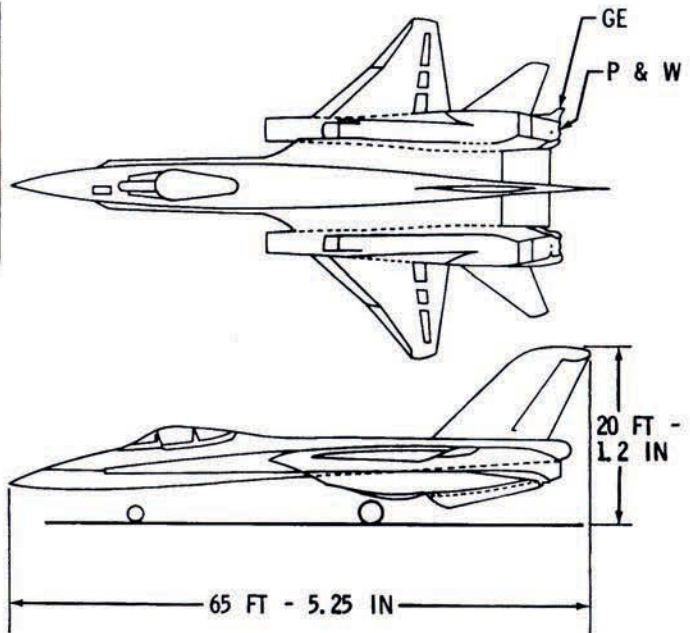
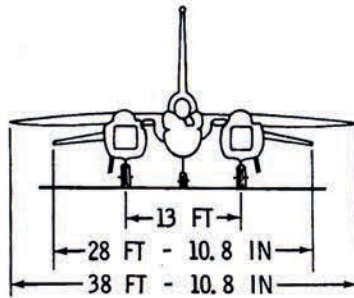
Finally there was 'Contractor A' from McDonnell Douglas. This proposal – designated 199-B – had two well-spaced engines (but not as widely spaced as the Fairchild offering) fed by two sharply-raked intakes, a bubble canopy but two vertical fins (originally the F-15 had a single fin, but this was changed late in the day) as well as two small ventral fins below. Take-off weight with four medium-range missiles was around 39,650lb but with a substantial wing area of 608sq ft and 11,400lb of internal fuel.

This design benefitted from the work done on the previous F-4, a team then led by Herman Barkey. Under his command, design work on the F-15 for McDonnell Douglas was led by George Graff, who was appointed head of the design team. The deadline for the proposals was the end of June 1969 and McDonnell Douglas' paper proposal ran to a total of 37,000 pages ➤

GENERAL ARRANGEMENT

CONTRACTOR B (FAIRCHILD)

	ENGINE	
	GE	P & W
TAKEOFF WEIGHT (LB)	39,975	39,750
(4) MRM		
WING AREA (SQ FT)	527	527
ASPECT RATIO	2.87	2.87
INT. FUEL (LB)	11,100	11,100

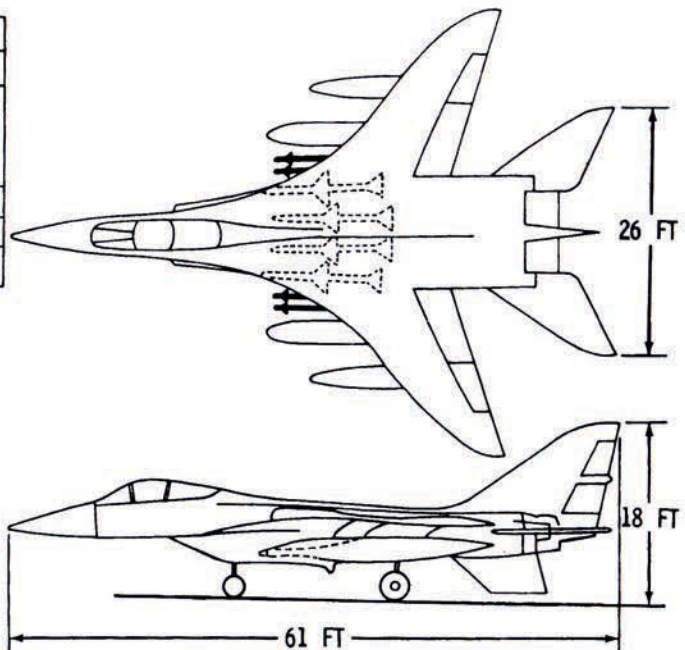
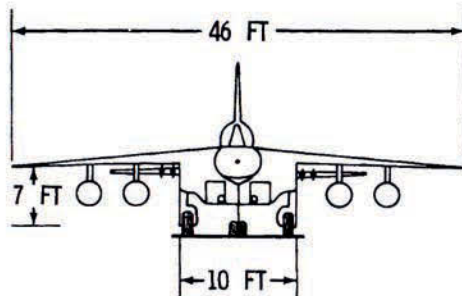


Fairchild's F-X offering featured a single tail fin and two widely podded engines. The area between the engines would provide additional lift, similar to the Grumman F-14 Tomcat, Sukhoi Su-27 and MiG-29 designs.

GENERAL ARRANGEMENT

CONTRACTOR C (NORTH AMERICAN)

	ENGINE	
	GE	P & W
TAKE-OFF WEIGHT (LB)	39,200	39,222
(4) MRM		
WING AREA (SQ FT)	500	500
ASPECT RATIO	4.23	4.23
INT. FUEL (LB)	10,471	10,331

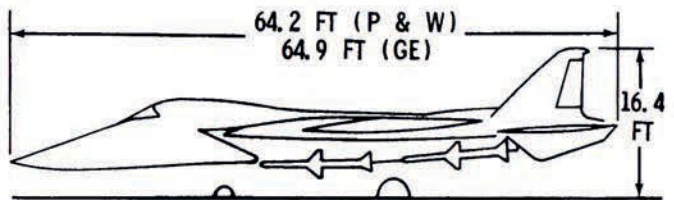
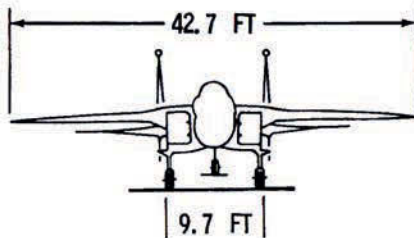
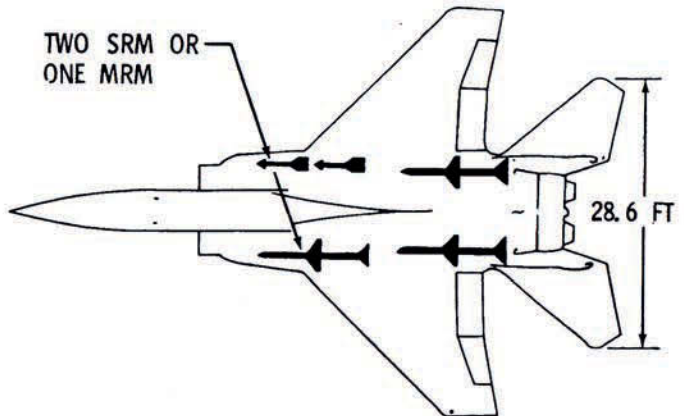


North American's F-X machine would also sport a single tail fin, but featured closely-coupled engines with a broad under-fuselage air duct, similar to the later General Dynamics F-16 and also the likes of the Eurofighter Typhoon. The four AIM-7 Sparrow missiles were grouped across the bottom of that intake trunking.

GENERAL ARRANGEMENT

CONTRACTOR A (McDONNELL DOUGLAS)

	ENGINE	
	GE	P & W
TAKE-OFF WEIGHT (LB) (4) MRM	39,523	39,740
WING AREA (SQ FT)	608	608
ASPECT RATIO	3	3
INT. FUEL (LB)	11,300	11,500



McDonnell Douglas' winning offering which would later become the F-15 Eagle. This was the only F-X competitor with twin tails. This drawing interestingly shows three medium range (Sparrow) missiles in semi-conformal stowage under the intake trunks, with one area accommodating two short-range missiles. Clearly all three F-X aircraft used a blown 'bubble' canopy during good visibility for close-in dogfighting.



The Eagle would feature a wide, head-up display - or HUD. On the glass would be displayed important information for flight, navigation and weapons aiming.

that stood 11ft high! This was the end result of more than two and a half million man hours of work.

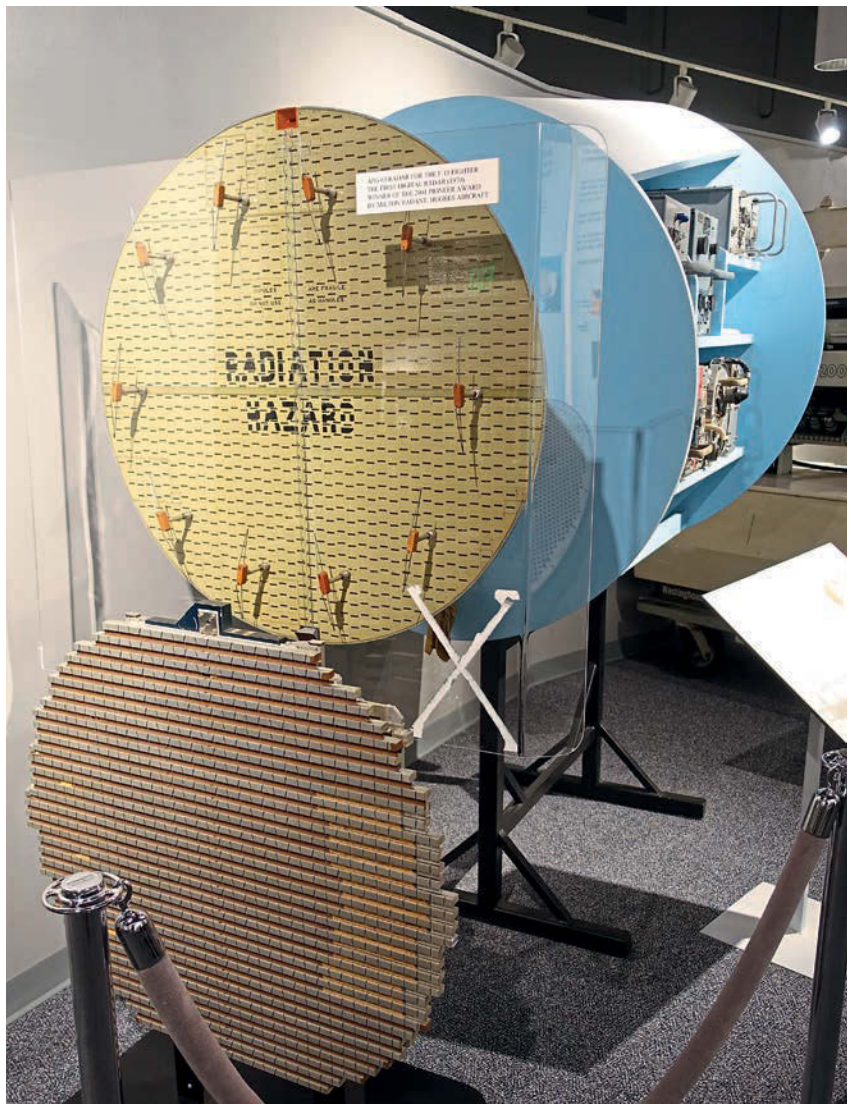
And it was a success as by December 23, 1969, McDonnell Douglas was announced as the winner. The resultant aircraft promised to be everything the F-4 was and wasn't. In no way was the F-15 going to be a tactical strike-fighter with multirole capability (although this would be latent in the design itself as was later proved) however it was going to have the added benefit of being able to outmanoeuvre anything in the sky thanks to that large wing and two powerful Pratt & Whitney F100 engines. Lessons learned from Vietnam saw the inclusion of a 20mm Gatling gun in the starboard wing root, something that many USAF fighter pilots had asked for.

An interesting start to the project was that the F-15 came straight from the drawing board – there was no 'fly-off' against a rival airframe, as there often had been previously and was later. Much criticism from previous programmes (such as the F-111) meant that this way forward was to be employed – and it worked.

The McDonnell Douglas team had looked at variable geometry early on but then rejected it due to excessive weight. Instead, a 45-degree swept wing of large surface area was to be employed (following a study of 100 different designs and a year in the wind tunnel). Surprisingly that large wing featured no high-lift devices like those seen on the slatted wing versions of the company's previous aircraft – the F-4E and S models of Phantom. In fact, an 'Agile Eagle' – a modified YRF-4C – had been testing slats destined for the Eagle. Instead, it was found that the wing just didn't need them, being of a highly cambered design that was extremely efficient in most regimes. Light weight was a priority, hence titanium would make up almost 26% of the airframe compared to just 9% on the F-4.

The use of an advanced radar (the Hughes APG-63 pulse-doppler 'look-down/shoot-down' unit) allowed the F-15 to be single-seat, without the separate job of radar lock and radar management to be taken on by a back-seater or 'RIO' (Radar Intercept Officer). Hughes received an \$82 million contract in September 1970 to build these units.

The radar was going to be a big jump forward in capability over that seen in previous F-4 Phantom II variants. The AN/APG-63 would be much more adaptable and powerful than the Westinghouse APQ-100/109A seen in the F-4C/D and AN/APQ-120 seen in the F-4E. While the APQs were low pulse repetition frequency radars, the APG-63 used high PRF and medium PRFs to locate and track targets even in ground clutter. The use of HPRF and MPRF also meant that the previous weak point of a pulse-doppler radar, in a tail-chase, was addressed thanks to HPRF and MPRF interlocking to give a much clearer picture of the target.



The McDonnell Douglas F-15 Eagle would eventually be built around the powerful Hughes (later Raytheon) AN/APG-63 radar.

For ease of use, the AYK Central Computer was integrated with 13 on-board systems, including the Tactical Electronic Warfare Suite (TEWS) which meant that the computer was effectively automating a number of the systems previously operated manually by the Weapons Systems Officer (WSO).

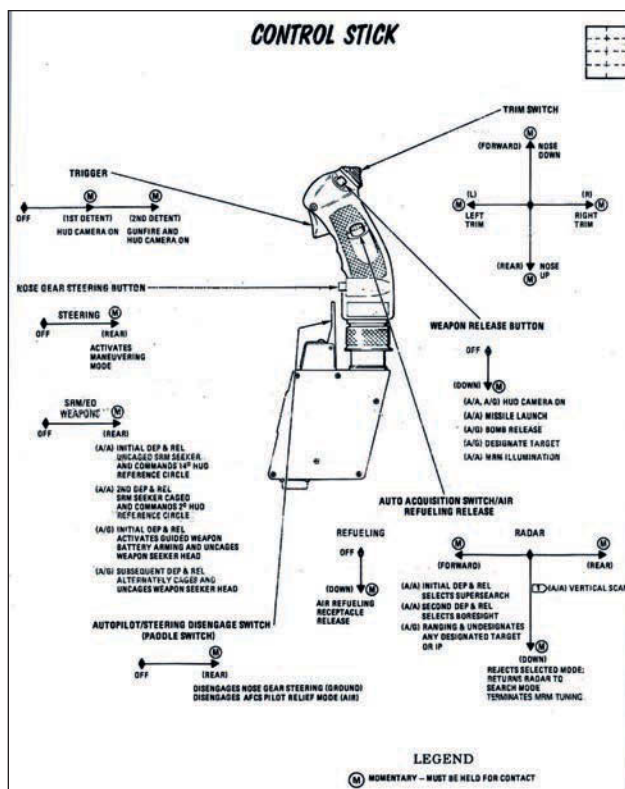
The result was a radar with almost four and a half times the search volume of the Phantom II and where the F-4 would have a 40 nautical mile search range on a fighter-sized target with a 10NM lock-up range, the AN/APG-63 gave the Eagle the eyes to detect bogeys at double that range in the 'look-up' mode or identical 40NM range in the more difficult 'look-down' mode.

Some of the systems used in the cockpit would also make things easier for the single pilot. For the first time in an out-and-out fighter, a wide head-up display (HUD) was used. First seen in the A-7 Corsair II, this replaced the traditional 'gunsight' – instead giving vital information on the aircraft's speed, altitude and engine power as well as information for weapon deployment.

The use of a HUD would soon become de-rigueur for any strike/attack or pure fighter as would another innovation called 'hands-on throttle-and-stick' or 'HOTAS' – a system where the key controls are placed on the joystick and the throttle controls so that the pilot does not have to delve down into the cockpit for a vital switch when flying the aircraft.

Linked with the HUD it allows the pilot to perform all the basic functions of air combat without removing their hands from stick or throttle or go 'heads down' in the cockpit. The idea was first used in the BAC Lightning, where some controls for the Ferranti AIRPASS radar/gunsight were placed on the hand controls, but this system was refined still further for the F-15 and subsequent fighters.

With each different aircraft the buttons would do different things – for example the later F-15E Strike Eagle would be able to control any sensors such as the forward looking infra-red systems (FLIR). Generally, HOTAS-equipped fighters would have a 'coolie hat' atop the main joystick to



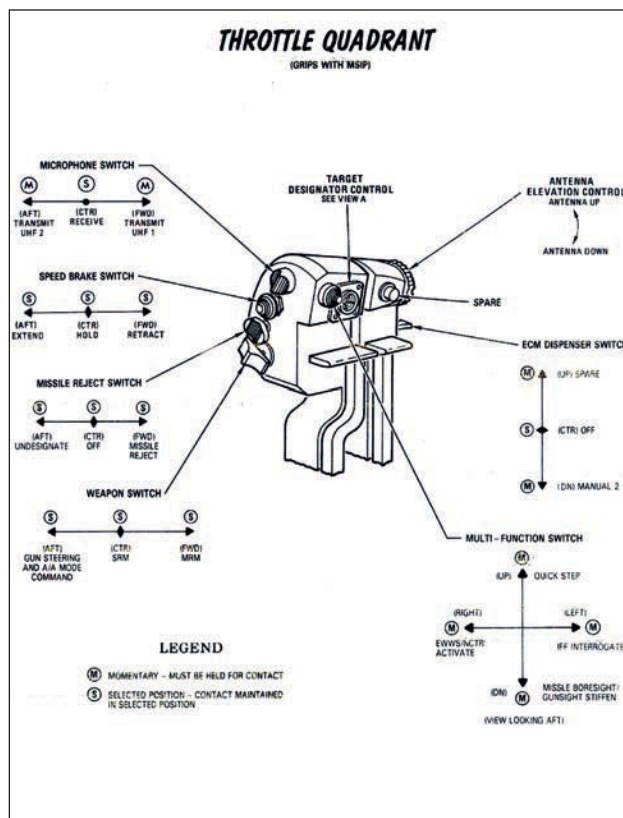
The Eagle's main control column featured many switches which kept the pilot's hands on the primary controls while they altered radar range, dropped ordnance, fired missiles/gun, altered the F-15's trim, controlled nose wheel steering or opened the air-to-air refuelling door.

help with trimming the aircraft, a trigger for weapons firing (normally cannon/air-to-air missiles) and another weapons release button near the coolie hat for air-to-ground ordnance. Other buttons and levers would either engage or disengage the autopilot, open or shut air-to-air refuelling doors and engage/disengage nose-wheel steering systems.

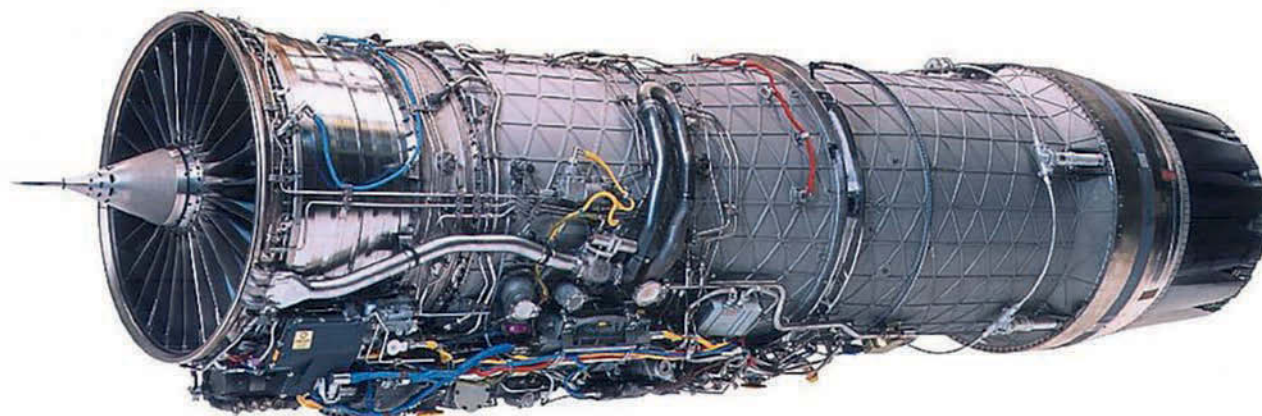
On the throttle quadrant, comms/microphone switches, the airbrake, the moving/slewing of the radar antenna, weapons selection and electronic countermeasures could be controlled/ejected. To add yet more functions,

switches could be held on, or 'rocked' to add more complexity. While the HUD/HOTAS combination was a great move forward for the fighter or attack pilot to keep his or her 'situational awareness' outside of the cockpit, one F-15C pilot remarked to the author that: *"You soon get used to it in the simulator and in the plane itself so that you have the manual digit dexterity of a piccolo player!"*

First-flight pilot Irving Burrows said in a 2003 interview: "As test pilots at McDD our staff had a small part to play in those early days – but we'd like to think an important one. We had assigned a team to work within



On the throttle quadrant you could control communications switches, radar antenna direction, ECM/chaff-flare countermeasures, target designation, weapons selection and operate the huge dorsal speed-brake.



After initial issues, the Pratt & Whitney F100 turbofan became a byword for reliability.

The need for a gun



The neat wing-root home for the Vulcan 20mm cannon was much better than the podded version, as seen here on an F-4.

and D models took down 10 MiGs with podded cannon, the F-4E shot down five enemy aircraft with the internal M61 while the F-105 took down three MiGs (one of which was shared with an F-4D) and even the B-52 bomber shot down two MiGs with its tail barbette of four 0.5in machine guns.

Other improvements came as a result of the Red Baron Reports and the Ault Report, where the lack of dogfighting skills/tactics in both USAF and US Navy doctrine was criticised – along with brochure performance rates of air-to-air missiles compared to actual combat conditions. This would lead to the formation of the Navy Fighter Weapons School, known more famously as TOPGUN and – thanks to Red Baron – the Red Flag series of exercises and the beginning of the Aggressor Squadrons, where experienced, highly-trained pilots in the art of dogfighting would aim to pass on hard-earned lessons to the pilots at squadron level.

Thanks to Vietnam the gun was back in fashion, and it would be included on the F-15 Eagle. Initially it was to be a 25mm gun that would use caseless ammunition. A competition between Ford-Philco and General Electric saw the former company awarded a contract for what was called the GAU-7/A.

This was to be a revolutionary gun as – using telescoped ammo with a combustible casing – it was to have longer range, higher velocity (and therefore hitting power) and a flatter trajectory than the faithful old 20mm shell. Using a combustible casing means you don't have to have a system for ejecting the spent cartridges or keeping them on the aircraft.

Sadly, by 1973 issues had been raised. The caseless ammunition would prove to be troublesome with some rounds exploding before being fired, meaning that the cannon fitment – on the F-15's starboard wing – and the ammo tank (stored in a vertical 'bin' arrangement below the dorsal air-brake) had to be reinforced and lined. More than \$100 million had been spent on the GAU-7 without clearing these issues and it was in 1974 that the Eagle was to return to the tried-and-trusted fitment of the 20mm M61-A1 Vulcan cannon, that had seen service in the US since the introduction of the F-104 Starfighter back in 1956.

Since then, cannon have been an integral weapon on most fighter and attack aircraft including the latest F-35 Lightning II and have proven their worth in air-to-ground missions in Iraq and Afghanistan – even if the last air-to-air guns kill was recorded in 1988.

had proved to be such a disappointment in Vietnam) would be semi-recessed along the corners of the intake trunks, while four short-range infra-red guided air-to-air missiles – the ubiquitous AIM-9 Sidewinder – would be placed on inner wing pylons. The one big change from the early versions of the F-4 Phantom II would be the inclusion of an internal gun. The General Electric 20mm M61-A1 cannon had seen service since inclusion on the (ironically) poor dogfighter that was the Lockheed F-104 Starfighter.

Despite the initial decision to develop a newer more refined cannon, the Vulcan was eventually used on the fledgling Eagle. This 'gatling gun' was to be installed in the starboard wing leading edge together with 940 rounds of ammunition. Range was also to be important in this big fighter, so provision was made for the carrying of three 610-gallon drop tanks or up to 9000lb

of air-to-ground stores: although the air-to-ground role was only secondary for the F-15 at this time.

Pratt & Whitney power

The engines that would power this fourth-generation fighter would eventually become the safest ever used by the USAF. Like the Eagle itself, the F100 can trace its roots back to the 1960s.

In 1967 there was a joint request from the Navy and Air Force for a new engine to power both the F-X (F-15) and the new Grumman F-14 Tomcat. While the USN (perhaps foolishly as it turned out) cancelled their requirement and continued to use the P&W TF-30 in the F-14, Pratt & Whitney won a lucrative contract to develop the F100-PW-100 for use in the Eagle.

Like the TF-30, the F-100 would have its own early share of issues as it was developed for use in the F-15 and (in -200

form) for the F-16 Fighting Falcon. High wear was initially found, with some aircraft shedding blades. Poor afterburner light-up times were found too as well as another problem with the 'turkey feathers'.

On early F-15s (and later, the Rockwell B-1B Lancer's General Electric F101 engine) it was found that the metallic plates that covered the intricate workings of the engine's nozzles, called 'turkey feathers', sometimes came off the aircraft during flight due to vibration issues. The easiest way to solve the problem was to simply remove the 'turkey feathers' which happened in the early 1980s. Over successive generations of the F100 motor, all these issues were solved – hence later models of the F-15/16 powered by the -200/220/229 series of the family had their turkey feathers restored. Since then, the F100 has become a byword for turbofan engine reliability. ➤

Model magic

Usefully for McDonnell Douglas, a three-eighths-scale 'Remotely Piloted Research Vehicle' would prove its worth in demonstrating the general design of the F-15 – but only after the full-sized machine's first flight!

In November 1971, NASA approved flight research for the F-15 RPRV. It would measure 23.5ft in length and have a 16ft wingspan and be recoverable in mid-air by helicopter. As a back-up to the long work done in the wind tunnel and on the full-size prototypes, this RPRV would feed data to the test team on basic handling as well as information on high AOA (angles of attack) agility of the F-15. These (relatively) cheap aircraft cost just \$250,000 each, were made from fibreglass and were unpowered. The project was backed up by a wealth of technology and facilities to get the most from the information garnered by these models.

These models were not to precede the

flight of the main prototype but instead increase the amount of data in a safe and controlled manner and carry a number of sensors and television cameras.

The first F-15 RPRV arrived at Dryden's Flight Research Center in December 1972 but didn't fly until October 12, 1973. The model was carried to an altitude of around 45,000ft beneath the wing of a modified NB-52 Stratofortress. Following release, ground pilot Einar Enevoldson guided the craft on a 10-minute flight which explored the McDonnell design's handling qualities, before being picked up by helicopter and lowered to the ground.

This helped development as it meant that during risky spin-testing the RPRV enabled the pilot to get a feel for how the basic F-15 airframe behaved, while not risking a \$7 million full-sized aircraft. It made around 27 flights between 1973 and 1975 during early testing of the F-15 and explored many areas of the F-15's

aerodynamic envelope, eventually carrying on until 1981 by which time 53 flights had been made.

Roll-out, first flight, first glitch

To say that the F-X/F-15 programme was a 'big deal' for McDonnell Douglas was an understatement. The USAF was going to buy 749 F-15 Eagles, but before it became a fully-fledged production fighter, 12 F-15s would be used as Category 1 test planes, then, eight would be Cat. 2 – later to be upgraded to operational aircraft, although this never happened.

The first F-15A prototype was built alongside the very F-4s it was designed to replace: F-4s that would see combat across the world. The Phantom II had become a global aviation phenomenon by the early 1970s and was the weapon of choice for the free world – more than 5000 would eventually be built. Would the fledgling F-15 garner as much success?



Costing just \$250,000 each, these 3/8th scale 'F-15s' would garner a wealth of aerodynamic information during testing from 1973 after being dropped from a Boeing NB-52.



Irv Burrows in the cockpit about to make that first, historic flight in 1972.



With some of the crew before the first flight.



A minor issue meant that the first flight had to be made with the landing gear in the extended position.

As the weeks and months rolled on, various 'firsts' were reached. Come February 1972 and the F100 engine had completed 60 hours of testing, while the structural tests of the major sub-assemblies of the F-15 itself were completed some months ahead of schedule.

On June 26, rollout showed this big new fighter to the world for the first (official) time and painted in air-superiority blue it looked the part. First-flight pilot Burrows recalled: "This day in June I started up the engines and taxied out from our hiding place behind one of the hangars to a spot on our ramp in front of the crowd of company and USAF people and guests. A champagne bottle was swung very carefully by the wife of the assistant secretary of the Air Force and with the appropriate speeches the F-15 finally became the 'Eagle.'"

The aircraft was then dismantled and flown in a Lockheed C-5A Galaxy to Edwards Air Force Base in California ready for its first flight. The pilot of which – Colonel Jesse Jacobs – would later remind Burrows that it was he who was the first man to actually get an F-15 airborne!

Irrespective of the F-15's first flight in the hold of a C-5A, many McDonnell

Douglas pilots had 'flown' the Eagle in the simulator. This was – for the late 1960s/early 1970s – pretty new tech. Irv Burrows said: "One of the tools we used extensively was the simulator. This was a cockpit built to scale with as much realism and accuracy in it as possible, but it was stationary inside a building. The instruments inside provided feedback to the pilot who was 'flying' the simulator: typically, the cockpit was inside a large dome, on the walls of which could be projected clouds, the ground and even another airplane. The pilot could then fly the simulator in any number of tasks, from take-offs and landings to dogfights with other aircraft (flown by a computer or another pilot). Back in those days our simulator facility was on the cutting edge of technology. We test pilots spent a lot of time over there as did some of our USAF counterparts."

The use of the simulator didn't just give the test pilots the 'feel' of the real Eagle and how it might perform it also helped develop systems, switches, cockpit layouts and the like for the production aircraft to come.

The aircraft that was to be the first Eagle in the air was serial number 71-280 and it was the culmination of many years

of work, but it was still – effectively – the 199-B which won the contract back in 1969. Refinements were few but gone were the ventral fins and in came larger main vertical fins. NASA (which worked with the USAF during selection as well as independently evaluating the designs) noted that subsonic drag was higher than originally thought, so the design change removed the ventral fins and subsequently added the needed area above.

By the time of the scheduled first flight – July 27 – the Eagle had gained Day-Glo wing tips, tails and intake trunks and a pitot/test boom on the nose. In a 2003 article first flight pilot Irv Burrows talks about the run-up to that fateful day: "Joe Dobronski, my boss and chief test pilot assigned me as first-flight pilot: a wonderful opportunity for me," explained Burrows. "There isn't a test pilot in the business who would not jump at the chance to make the first flight in a newly-developed airplane. My good friend Pete Garrison would be back-up pilot in case I broke my leg skiing or some such thing!"

For Irv, thoughts were already on him flying a new airframe *and* new engines, as – by that point in time – it was hoped that

The 'other' Eagle...

Decades before the McDonnell Douglas F-15 Eagle was even on the drawing board, a very different aircraft, designed for the United States Army Air Force, had been given the 'Eagle' name.

In the autumn of 1942, the Fisher Body division of General Motors began to design an aircraft which would be able to climb quickly to operational altitude. According to the USAAF's issue of proposals, this aircraft was to possess a high climb rate so it could reach fighting height quicker than the enemy: lessons learned from the Battle of Britain. In October 1942, Fisher was awarded a contract to build and develop two prototype XP-75s which would later be called the P-75 Eagle.

This aircraft was – in effect – a 'bitsa'. The airframe used parts from the Vought F-4U Corsair (landing gear), P-40 Warhawk outer wing panels (later changed to P-51 Mustang items) and the tail from a Douglas SBD Dauntless (later refined). The design had a mid-engine – similar to the P-39 Airacobra and two contra-rotating propellers. Power came from the Allison V-3420-19, a 24-cylinder 'double V' engine rated at 2800hp – the most powerful liquid-cooled inline motor then developed in the USA.

The first aircraft flew in November 1943 with six XP-75s being built for testing during 1943/44. Despite much refinement (new tail, 'bubble' rather than 'bird-cage' canopy) issues included the centre of gravity for the aircraft which didn't help the machine's spin characteristics and poor engine cooling (improved during flight testing eventually).

By the time the aircraft entered testing, the need for long-range fighters in the ETO was most pressing, so six more XP-75s were modified for a long-range escort role. An order for 2500 was placed – but cancelled when it was clear that existing, developed and proven aircraft such as the P-51, P-47 and P-38 could take the role. The P-75A Eagle project was effectively terminated in October 1944, only eight XP-75s and six production P-75s were completed.

The Eagle's performance was a 433mph top speed at around 25,000ft, a more than 2000-mile range and a service ceiling of more than 35,000ft. Armament would have included ten 0.50in Brownings (six in the wing, and four in the fuselage) and potentially bombs and rockets.



The Fisher XP-75 had a mid-mounted engine as was designed from the outset for air-superiority – it never saw service.

the F100 would have been flying in the F-14 Tomcat, if only the Navy hadn't pulled out of the joint engine programme... Burrows remarked: "So, we'd be flying a brand-new airplane with engines that had never been developed through airborne testing. That's why we made the first flight at Edwards, just adjacent to the dry lake, Muroc Lake, which provided us with a 10-mile long emergency runway – should we need it."

With much of his huge experience on the F-4 Phantom over the previous decade, on the run-up to the first flight Irv managed to get (with USAF approval) a number of flights on other aircraft, such as the F-104 Starfighter, the Northrop T-38 Talon, as well as McD's own A-4 Skyhawk: "Pete and I did this as we believed we needed to expand our horizons a bit and prepare for a new and different cockpit and airplane feel." More time in the simulator would copy exactly the first-flight profile.

At around 7am on the morning of July 27, 1972, Burrows climbed into 71-280 after a long, painstaking walk around the aircraft, before which the twin F100 engines had been spooled-up, with the aircraft restrained and chained to the ground. Helping him strap in was Glenn Lewellyn, an inspector on the project. Most of the team from McDonnell Douglas were based about 40 minutes away and they had left at around 4am to get the F-15 ready for this historic moment.

Burrows would be 'chased' by his good friends Pete Garrison and Colonel Wendell

'Wendy' Shawler – who would later be the first USAF pilot to fly the Eagle and the first-flight pilot of the A-10B Night/Adverse Weather Thunderbolt II two-seater. Both flew in F-4 Phantoms with a cameraman in the rear seat.

Burrows placed 71-280 at the end of the Edwards runway and unleashed the power of the F100s with his left hand. This was maximum 'dry' thrust without afterburners, so this meant the pilot would get a good feel about the aircraft on take-off and learn something about its behaviour. The aircraft then jumped into the air for its first 50-minute (or so) flight. During which time the Eagle got to 12,000ft and a max speed of 320 miles an hour.

But it wasn't without incident. Burrows: "So off we went – a comfortable take-off and impressive performance to around 2500ft. Then came the only glitch in the first flight. When I retracted the landing gear a red light in the cockpit told me that all was not right. Either Pete or Wendy moved in close enough to see that one of the doors that closed over the gear when retracted was not closed flush. Enter Plan B: after extending the landing gear (and heaving a sigh of relief that all three wheels were going to be in the right place for landing) we proceeded with the back-up plan – a test flight with the wheels down.

"Over the next hour or so we were able to accomplish a lot – handling quality checks on both the airplane and engines up to 15,000ft or so, speed brake extensions

(during which we experienced too much buffet) practice landing approaches to get a feel for a good approach speed and afterburner light-ups and shut-downs on each engine. We were able to compare the airplane's flying qualities with that of the simulator and found that the correlation was quite good. The airplane 'felt good', the visibility from the cockpit was spectacular, the response to control movement was quick and precise and the power from the engines was impressive. Bob Little, who as chief test pilot for McDonnell back in 1958 had made the first flight on the F-4 Phantom II, once told me: *'I knew it was a winner.'* I felt the same about the Eagle."

Burrows made the landing approach at around 170mph, made a gentle touchdown with the dorsal airbrake only half extended. He held the nose wheel up until the Eagle was going relatively slowly before letting it kiss the ground. All three wheels were down, and the first flight had been a success. After touchdown the canopy cracked open and Irv got out: giving a 'thumbs up' sign to the waiting McD's crew and staff. For the Eagle, it was an auspicious beginning, and the test schedule was going to be a busy one.

The flight test programme continued on schedule without any major issues through to the F-15's 1000th flight in November 1973, by which time the Eagle had really spread her wings, flying at over 60,000ft and reaching a top speed of Mach 2.3.

The Eagle had finally flown the nest. ■



As the F-15 moved to production, changes were made to the airframe – not least the increased size of the dorsal air-brake, as shown in this 1980 shot.

Into service

Developing a top-line military jet fighter is never going to be without its issues, but the F-15 Eagle enjoyed a relatively smooth ride into service with the USAF at the height of the Cold War.

Following the first flight of the prototype, development flights for the F-15 test programme got under way.

Things went remarkably well for such an advanced aircraft, with many attesting that the hours in the wind tunnel and on the simulator had paid real dividends. As an example, within four months of flight testing the engine inlet compatibility was completed for the F-15 programme. For the F-4 this alone had taken 22 months, while for the F-101 Voodoo it had taken 30 months.

While pilot feedback on the Eagle was initially very positive, there were some issues to be ironed out. Pilots found that on crosswind landings one of the wings wanted to lift up on the down-wind leg. This was solved with changes to the

control augmentation system. While the F-15 was flown with conventional hydraulic controls without the use of a fly-by-wire system in the later F-16, the CAS (Control Augmentation System) was basically a computer between the pilot and the controls which helped the pilot avoid dangerous parts of the performance envelope, effectively making it safer to fly. A number of issues were solved by simply changing the CAS.

By the end of 1974 only 36 engineering change proposals had been submitted and only three affected the overall 'look' or aerodynamic shape of the F-15 itself. The first concerned the horizontal tailplanes. It seemed that there was a buffet issue, but a dog-tooth leading edge cured the problem. The second was the main wings. At speeds of around Mach 0.8-0.95, at altitude and

pulling around 6 g, there was a buffeting which pilots described as severe: so severe some felt the aircraft was going to break up in flight. This was found to be caused by the rear part of the wingtip getting excessive lift. To cure this, the wingtips were raked back and 3sq ft was removed from each. Finally, the buffeting that Irv Burrows described from the dorsal airbrake on that first flight was solved when they upped the size of it from 20 to 31.5sq ft, so more drag was produced at less than full openings.

These changes were subtle and hard to spot but taken together they show how fast F-15 development was going. Production was also speeding up, with the first five aircraft taking just 466,000 man hours to produce compared to the 690,000 expected. By the spring of 1974 it was estimated that the F-15 Eagle took 32% fewer man



Early F-15As would very soon be replaced by F-15Cs – and the ‘turkey feathers’ on the F100 engines would be removed, too.



Pre-production F-15s share the ramp with F-4 test machines. Development was swift.



A pair of Bitburg F-15As from the 22nd TFS (36th TFW) seen at Alconbury in November 1978.

hours to build than originally thought. Six performance milestones were set for McDonnell Douglas to complete by the end of 1974, but by April 1973 McDOD had already completed four of them.

It wasn't all sweetness and light. Firstly, there were cost overruns, which by the late 1970s amounted to several billion dollars above the initial costings. Second, the Pratt & Whitney F100 engines were having their own problems, including afterburner light-up issues (thanks to pressure build-up in the engine nozzles), fuel control problems and some turbine blade issues.

Early on – and when the F-16 had come on stream with its single F100 powerplant – it was said that the F100 in the Eagle took double the man-hours of maintenance effort than on the Fighting Falcon. Some put that down to airflow around the engine: no F-16 ever had its 'turkey feathers' removed.

Another big 'first' for an engine was the number of times the thing would go from full military power or even afterburner back down to idle. With the F-15 effectively heralding in a new era of dogfighting, not just the airframe but the engines were regularly being put through their paces and not just left in full power, but going from idle to full AB during dogfighting. History shows that the engine has gone on to be a paragon of safety, performance and excellence, but issues and cost implications are what's going to happen when you're developing not just a new airframe, but the powerplant and avionics as well.

It was a unique situation and one that was handled brilliantly by all concerned, even if – during 1978/79 – there was the situation where Eagle airframes were coming off the line without the engines to put in them.

With such advanced avionics, again it was a considerable achievement that so few issues raised their heads. One advancement



Line Replaceable Units helped the F-15 stay aloft for fewer maintenance hours than the F-4 Phantom II.

that helped was the use of 99 LRUs (Line Replaceable Units, effectively black boxes) and a system with BIT (Built-in Test). With these in place, even though there were a considerable number of issues which often led to maintenance being behind the 8-ball on repair, data was gathered, lessons were learned and improvements made swiftly.

The more pilots who flew the F-15 the more came to love its virtues of power, agility and (especially) sustained turn – as well as unrivalled (until the seamless F-16 canopy) visibility from the pilot's seat. The differences between the Eagle and its predecessor the F-4 (still, by 1974, in full production for the USAF and overseas customers) was huge and not just in terms of outright performance: that was a given.

By early 1974 it was found that building an F-15 took only 80% of the man hours it took to build an F-4. This was thanks in part to large, machined components which meant fewer joints. Many other systems were reduced or rationalised. The F-15A didn't need a landing parachute – unlike the F-4E. It had 30 cockpit instruments compared to the F-4's 48 and nine flight control 'black boxes' compared to the F-4's 16. The F-15 had around a third of the plumbing connections the Phantom had, 1200 to 2800 fasteners and a hundred fewer electrical connections. It also had four times the area of quick-release hatches for maintenance compared to the F-4. Best of all, the F-15 was working out to be 11.3 maintenance hours per flight, compared to

24 for the F-4E – this was in Second World War fighter territory.

Two-seater roadshow and service entry

With development continuing apace, it was decided in 1974 to push the F-15 Eagle to the outside world. To this end, the second two-seater F-15B (still known then as the TF-15) was to display at Farnborough. First flight pilot Irv Burrows was joined by Colonel Wendell Shawler to fly to the UK and demonstrate the F-15 to the world.

The flight went from Loring Air Force Base in Maine and flew straight to RAF Bentwaters in the UK in just under five and a half hours. The F-15B was carrying drop tanks as well as the then-new FAST 'Fuel and Sensor Tactical' packs scabbled under the inside of each wing and attached to the intake trunk side. This extra 10,000lb of fuel effectively doubled the aircraft's ferry range.

During a European tour, the aircraft performed 92 demo flights in just 43 days. Over the next few years, the F-15B would showcase the power and agility of the Eagle with flights – not just in the UK – but in West Germany, Japan, South Korea, The Philippines, Denmark, Iran, Norway, the Netherlands, Israel, Belgium, Saudi Arabia, Australia, Guam and Canada. It was clear that many of the stopovers were in countries that might be in the market for a modern fighter jet...

With the Eagle approaching service entry, it was important to get the right guys

(and they were all guys back then) into the cockpit of the USAF's premier fighter. The first rule was that any selected pilot would have 250 hours on fighters. It was logical that F-4E jocks would be the prime candidates to slip into the F-15 cockpit, but the USAF found that adaptability and the individual's ability to learn was of prime importance.

Eventually, in January 1976 the 1st Tactical Fighter Wing – with tail-codes 'FF' based at Langley, Virginia began to convert to the new McDonnell Douglas fighter, and this is where many of those early problems were encountered – and ironed out. The second wing to equip was the 36th TFW, based at Bitburg in West Germany, proudly using the 'BT' tail code. This wing became operational a year later, in 1977, by which time the third wing was gearing up for conversion: the 49th TFW at Holloman Air Force Base, New Mexico.

The first Eagle deployment to Red Flag at Nellis Air Force Base was made in 1976. This helped accelerate operational and maintenance readiness as both pilots and ground crew got used to their new machines. DACT (Dissimilar Air Combat) against other aircraft by now had moved beyond just the F-5s of the Nellis-based aggressor squadron and included Northrop T-38 Talons, Navy F-4s (J/S models) USAF F-4Es and F-106 Delta Darts. In the meantime, more wings were activated with the Eagle, including the 57th based out of Nellis (WA tail codes) the 32nd Tactical ➤



During the early Eagle years, two-seaters including this 'Bicentennial Bird' then called the 'TF-15' would fly the flag for McDonnell Douglas' new fighter.

Streak Eagle

Much was initially made of the F-15 Eagle's amazing speed and – indeed – thanks to the threat of the MiG-25 Foxbat its dash speed of Mach 2.5 was much trumpeted in the early 1970s. This was, however, a bit of an irrelevance as with a decent war-load the F-15 couldn't go much faster than Mach 1.7.

However, both the USAF and McDonnell Douglas knew that the speed of a fighter could be headline news. In late 1974 they got together to come up with an idea for an event to show the world this new fighter and show the US taxpayer what they were getting for their dollar.

Therefore – at an expense of more than \$2 million – a 'show' was put on, where a stripped and lightened early F-15 would take a series of time-to-height records. Five of these records were held by the F-15's predecessor, the F-4 Phantom II from 1962 while the higher-altitude ones were held by the Soviets with their Foxbat.

Three USAF pilots were to take part in these attempts and they would break all eight records over a period of 17 days, between January 16 and February 1, 1975, over Grand Forks Air Force Base, North Dakota.

But first – what was 'Streak Eagle'? It was the 19th pre-production F-15 called 'F-17' and was stripped of all non-essential materials and equipment. All the radar and associated avionics, the Vulcan cannon and ammunition 'bin' and feed chutes, flap and speed brake actuators, radios, one hydraulic system, some cockpit displays and a generator were removed. Some equipment was added, such as a pressure suit for the pilot on some of the attempts, a pitot boom to give more information to the pilot and instruments to help measure the speed and acceleration of the aircraft.

With all attempts beginning with a 'standing start', the arrestor hook was replaced with a hold-down hook which would be released when the timer was begun. Also, the entire surface of the aircraft was left unpainted, to save yet more weight (and gain around 15mph). The changes meant that Streak Eagle was 1800lb or 817kg lighter than a production F-15A and – to ensure the best performance – only the correct amount of fuel for the attempt would fill the Eagle's tanks. It was estimated that the Streak Eagle had a thrust-to-weight ratio of around 1.5:1!

On January 16 the five F-4-held records were broken all in one day. The first record to go was 'time to 3000m (9843ft)' which Major Roger Smith beat by a 20% margin. The previous best was 34.52 seconds with the Streak Eagle setting a time of 27.57 seconds. The aircraft was taken to full throttle under the hold-back system and the Streak Eagle – when released – took off after only a 400m take off roll. So fast was the acceleration that the pilot had to be quick to get the undercarriage tucked away before the associated gear and doors went past their 'never-exceed-speed' as the aircraft went almost vertically upwards in a 5g climb. Some attempts were actually aborted due to this issue.

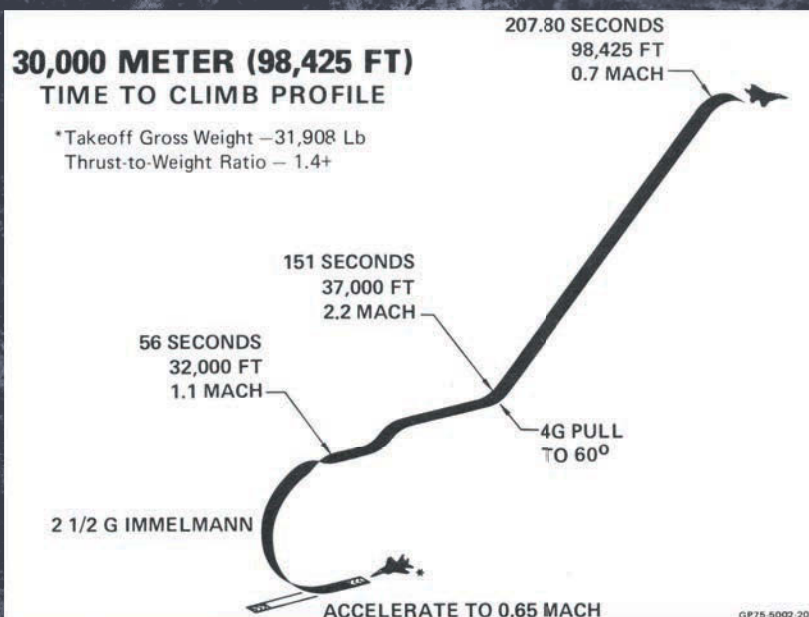
The next three records were beaten in a single flight, with times being taken at the requisite altitudes. In the 'time to 6000m (19,685ft)' attempt Major Willard 'Mac' Macfarlane beat the F-4's time by 19% (48.79s vs 39.33s.) The 'time to 9000m (29,528ft)' saw the F-4's 61.68s record beaten by 21% with the Streak Eagle getting to the required altitude in just 48.86s. For the 12,000m (39,370ft) attempt, the Eagle beat the F-4's best by 23% – 77.14s compared to the Eagle's 59.38s.



The Streak Eagle was a stripped-down early production F-15A which was used to net a number of world records in 1975.



Streak Eagle pilots (from left): Major W. R. Macfarlane, Major Roger Smith and Major Dave Peterson.



A diagram of Streak Eagle's 30,000m attempt.

then pulling a 4g, 55-degree climb, supersonic, until it went through the requisite altitude. The same technique would be used on these higher altitude record flights.

On January 26, Peterson would take the 25,000m (82,021ft) record from the Soviet aircraft, beating it by some 16%: 192.60s versus the Eagle's 161.02. Smith would be back in the saddle for the 30,000m (98,425ft) record on February 1, where the Streak Eagle's winning advantage would be 15%, thanks to their 207.80s 'to-height' time compared to the MiG's 243.86s.

These records would prove to be a significant PR coup for both the USAF and McDonnell Douglas. So successful were the records set that they wouldn't fall until the 1980s, when – between 1986 and 1988 – a similarly stripped Sukhoi SU-27/T-10 (or P-42 as it was known) bettered the records, apparently boasting an almost 2:1 thrust-to-weight ratio!

The Streak Eagle itself – being a pre-production aircraft and one stripped of all non-essential equipment – was never made into a production F-15A (that was considered too costly) so instead it was painted in air-superiority grey – to prevent corrosion – and then delivered to the National Museum of the United States Air Force at Wright-Patterson Air Force Base, Ohio, in December 1980.

Fighter Squadron at Soesterberg, Holland (CR tail code) and – in December 1978 – the 33rd TFW out of Eglin AFB, Florida with EG tail codes.

Enter the C and D Eagles

As the 1970s drew to a close, F-15A and B models were growing in numbers in the USAF. By the end of 1977 the 49th TFW were receiving their Eagles and by now around 250 F-15s had been delivered, flying around 59,000 flight hours on 44,000 flights. As the F-15 matured, pilots and crew were becoming more adept at getting the best out of the aircraft, but already a new version was coming down the line.

The first F-15C, numbered 78-0468 first flew in February 1979 with the first F-15D following in June of that year. This was to be – effectively – the (still) ultimate version of this now venerable fighter.

Changes were difficult to spot and mainly under the skin – but they were far-reaching. Firstly, the AN/APG-63 radar was improved with the addition of increased processing power. Additional internal fuel tanks gave yet more internal fuel, while a new ACES II (Advanced Concept Ejection Seat) bang seat made urgent departures from the Eagle more survivable. A strengthened undercarriage



McDonnell Douglas F-15s seamlessly rolled off the production line and into the squadrons at the end of the 1970s. The C model was now a 9 g fighter. And it's still in service today.

helped with a higher gross weight (68,000lb), while improved Pratt & Whitney F100-220 engines gave around 24,000lb in afterburner. It also ushered in a new 'Digital Electronic Engine Control' (DEEC) and much better reliability.

The airframe was now allowed to go to 9g – not the previously limited 7.5 g. FAST or 'Fuel And Sensor Tactical' scab-tanks could be used – but could not be jettisoned

The last of the three flights that day saw Major Dave Peterson beat the old 'time to 15,000m (49,212ft)' record by 33%: the F-4 could manage the height in 114.50 seconds but was thrashed by the Eagle's 77.02s time. For this attempt and all the later flights, pilots would be wearing a full pressure suit. And he'd need it... as Peterson lifted to around 50ft over the runway, at around Mach 0.65 he pulled hard on the F-15's control column and hit the target altitude some 10 seconds quicker than the time to that height set by the Saturn V moon rocket!

Now it was time to beat the Soviet MiG-25 Foxbat's 1973 records... On January 19, Smith would shatter the 'time to 20,000m (65,617ft)' by some 28%, with the MiG-25 clocking 169.80 seconds and the Eagle 122.94. The Streak Eagle would start 'on the deck' at around Mach 0.65, before pulling up at just 2.5g into an Immelmann over the top at 32,000ft before accelerating in the opposite direction to take off,

– bolted as they were to the main intake trunks. The overall weight of the F-15C went up by just 650lb and the first C/Ds seamlessly rolled off the production lines at McDD at the end of 1979, allowing the earlier models to head to the Air National Guard units. As old as even the youngest C/D models are, they would receive constant upgrades of their own to stay current with modern threats. ➤

Don Kilgus (left) and some of his pilots.



Flying the Eagle

What was the F-15 Eagle like to fly in the first decade or so of its life, when it was the new kid on the block? Donald W. Kilgus flew the F-15 after a stellar and much decorated USAF career flying other combat aircraft.

Born on June 10, 1937, in Detroit, Michigan, Don was commissioned in the USAF in 1960 and initially flew the North American Super Sabre in Japan, in the USA and later in South Vietnam.

As a prelude to his time in the F-15, it's worth noting that he could well have scored the first MiG kill of the Vietnam conflict. The history books show this was made on April 9, 1965, by an F-4B Phantom II of the US Navy, but there's evidence (much from the Vietnamese themselves) to say that Kilgus actually took down the first MiG (a 17 'Fresco') on April 4 in his F-100D Super Sabre but it seems that politics at such an early stage of that conflict and the lack of initial confirmation meant that his kill wasn't officially recognised.

That story is beyond the scope of this publication (although it's a great read, go look it up) but Don painted a MiG kill marking beneath his cockpit from then on. The man himself was to become one of a special breed of aviators, maybe unique as he was not only a MiG killer, but he would become a 'Misty' Forward Air Controller in his F-100 and become one of the early exponents of the art of the 'Wild



The Eagle could boast AIM-7 Sparrow medium range radar-guided missiles (being launched here) as well as short-range AIM-9 Sidewinder heat-seekers and a 20mm Gatling gun Vulcan cannon with 940 rounds

Weasel', using the Republic F-105F and G Thunderchief, where his mission was to locate and destroy enemy radar and surface-to-air missiles. A dangerous job... Kilgus was forced to eject from his own F-105 in November 1970, after being hit by a SAM. He was later rescued by a Sea Stallion helicopter.

Fast forward to the mid-1970s and Lt Col Kilgus flew as an F-4 Phantom II and F-15 Eagle pilot, becoming commander of the 8th Tactical Fighter Squadron at Holloman from December 1977 to January 1980. Initially flying the venerable F-4E Phantom II, he was in charge of the unit when – in 1978 – they transferred to the F-15A Eagle. He retired from the USAF in 1985 as a colonel and tragically died in a car accident in July 1988, aged just 51. He won two Silver Stars, one for consistently exposing his aircraft and himself to enemy fire during a mission in which he provided cover to slower SANDY rescue air elements.

The following first-person account of flying and fighting with the Eagle was made after the early days of the F-15A and C into the mid-1980s and comes off the back of Don's many hours in other fighters as well as the 350 he logged in the Eagle and is reproduced here courtesy of the Kilgus family, following its appearance in *Take Off* magazine.

The F-15 is the first of a whole new generation of airplanes that can defeat the man flying it. You can pull so many Gs in this airplane, for so long, that it can out-turn you, physically. A man just can't sustain the g-loading.

Earlier planes – like the F-4E – would run out of energy before the pilot had to give in. You could throw it in to a 7g turn, but it couldn't sustain it for long. You're bleeding off the airspeed because you don't have enough power to keep it up above the point where you start losing energy. But in the F-15, even if you do ask it to do too much, where another aircraft would depart at high angles of attack the Eagle just gets tired. When you pull too hard or the airspeed gets too slow, it doesn't snap, it doesn't stall, it just tells you that it's giving you all it has – but that's rare.

I've been in fights with the Eagle where I've just pulled so many Gs for such a long period that I just had to physically let up on the pole so that I could get some oxygen back down into my lungs again. You can black out through G-LOC if you keep pulling – G-induced Loss Of Consciousness. That's why you have to recognise when that's coming. If you build up the G smoothly then you can tell when it's coming, when you start to black out as your eyes lose the blood-flow and oxygen going to them. But if you suddenly jerk into a 7 or 8g turn – and you can do that – then you can easily over-g your body and go into G-LOC.

That's why we have 'Bitchin' Betty to whisper in our ear and warn us that we're going into overload. Both the Phantom and the Eagle have an analogue flight control system called CAS – the Control



Don returns from a posting and is welcomed home by son Kevin.

Augmentation System. It's like a power steering set-up in a car. In the F-4 you could over-g it, but you knew you could, it took effort to do it! The F-15 is different: you know you can over-g it easily so the Overload Warning System gives you a warning – and nothing as basic as a hooter. We call the OWS 'Bitchin' Betty' as it's a female voice (tests show we listen to a female voice in times of stress) and in your headset she says: 'OVERLOAD, OVERLOAD.'

If I had to go up against a MiG-29 and fight I would have complete confidence in the F-15. With that tremendous power behind you, you can choose the moment and altitude of your engagement, get on top of the other guy and really come boring down on him.

On guns and heat-seeking missiles you can concentrate on the visual engagement. The other guy appears in your HUD and you're looking at him, heads-up all the time. The F-15 can engage with the gun, Sparrows or Sidewinders, so we have a versatility we were lacking before. We're talking about a serious weapons load – internal M61-A1 20mm Gatling gun with 970 rounds (the F-4E only had 640) four AIM-7 Sparrows and four AIM-9 Sidewinders. It's no wonder that the F-15 is the world's best combat aircraft!

Set it against its predecessor, the Phantom, and you can see the improvement in aircraft design: especially in radar. The F-4E's radar was never very good and it used to break down at the worst times. It cost a lot of guys' kills. To get good results out of the Phantom's radar you had to be very good.

As you fly more aircraft you realise what you'd do better or what you'd want done differently – and then along comes the F-15 Eagle and it's beautiful. It's got a cockpit as big and comfortable as the F-105 Thud, but better organised and better laid out. The most comfortable office you'd ever want to be in. Behind the seat there's even room for an overnight bag.

What's more important is the way the controls are laid out, the amount of thought that went into the design. HOTAS means 'hands-on throttle-and-stick' and that means you don't have to move off your hands off the flight controls in order to do something else. All the controls you want are either on the throttle or stick. I control all the weapons like a musician plays his instrument: he doesn't look at his fingers and neither do I...

On the throttle lever there are 13 different controls. The speed brake, the mike buttons, a three-position switch that selects what you're going to shoot – radar missiles, heat seekers or guns. Remember what I said about that radar? Well, when you move that switch the radar changes range mode. So if you select guns and the radar was in 80-mile range mode, it immediately shifts to 10-mile mode. When you select a weapon, you automatically select everything else that's necessary to fire that weapon.

Then there's the thumb wheel that controls the tilt of the radar antenna, so you can look down, or straight out or up and around the side of that is a toggle that drops flares or chaff for self-defence. There's also the control for the cursor on the radar scope that designates the target you want to lock-on to... You've got more controls on the stick (but not as many as 13) so everything's where you need it. Best of all they are just inputs to the computer system, so they can be changed. Some of our guys wanted different lock-on modes for their radar. So, one Friday evening we parked our aircraft up as usual and by Monday morning the new switch set-up was ready to go...

All of this combines to give you a great feeling of confidence in the aircraft. You sit in the big, roomy cockpit of an F-15, up high, looking out over the world with a great radar and all the rest and you feel like you can go out and shoot anybody. It's the best airplane we've built in a long time. It sits right there with the classic P-51 Mustang and F-86 Sabre."

Dissimilar fighting and fake canopies

Much was made of the Eagle's prowess as an air-to-air fighter, but – at least initially – much of the 'trade' or competition would come from the other 'teen' series of US fighters, at least until the Israeli Air Force blooded the F-15A in 1979.

But on entry into USAF service questions were being asked – both in the Pentagon, and out in the wings and on the carriers themselves: could the F-15 be bested by a Grumman F-14A Tomcat? Was the General Dynamics F-16 Fighting Falcon the best close-in dogfighter ever? Or was McDonnell Douglas' own F/A-18 Hornet – with its accent on the high-alpha dogfight – the machine to beat?

Of course, inter-service rivalry accounted for a lot, in the early days: the F-14 with its 'million dollars a shot' AIM-54 Phoenix long-range missiles versus the F-15 and its recalcitrant Sparrows?

The answer – of course – is that the best pilot or crew often wins and, sometimes, you'd find a good F-4E driver and his Whizzo taking down a new Eagle pilot on exercise. The Eagle versus Tomcat was an interesting one (learn what the Israeli Air Force felt about both in a later chapter) but it's interesting to hear stories from 'the other side.' This one illustrates experience over youth...

Dave 'Bio' Baranek is a legendary (now retired) F-14 RIO (Radar Intercept Office) instructor and keen photographer. He recalls: "Some days everything falls together. We're on a Key West detachment and we're tasked with flying some four versus four with F-15s out of Tyndall. They're up in the Florida panhandle, so we're in the areas over the Gulf of Mexico. They're students... we figure we'll give them a lesson.

"So, after the phone brief, we get off early and fly low, right up the middle of Florida instead of going north over the water. They're all scanning south and we come at them low from their nine-o'clock. We shoot them all with Sparrows before they know we are there, then, we pull into them and kill them again with Sidewinders. These guys had an instructor in the back of the two-seaters who said he saw us. I'm not so sure, but that's okay. The AIM-54 Phoenix wasn't in the rules, but for the

hell of it we shot them all down from somewhere over Disney World: our radar was just perfect."

Another classic Cat versus Eagle story comes from the many such legends from Joe 'Hoser' Satrapa. As a kid he was good with a rifle, then when flying the F-8 Crusader his instructor saw how he just 'hosed' or sprayed bullets at the towed target and proclaimed: "We've got a hoser, here..." As usual in the fighter community, the nickname stuck.

By the time 'Hoser' was in the F-14 Tomcat community he was the stuff of legend. During his notable gunnery debriefs, he would show a slide (not this one illustrated) where the pipper of an F-14 was over the centre of the F-15 Eagle's huge wing... he'd ask the students: "*What's wrong with this picture?*" It looked good to them... Hoser would answer: "*The pipper isn't on the GODDAMN CANOPY! No kill like a guns kill! Pull on the pole until the rivets pop and the RIO pukes!*" Rumour was that – such was his finesse with the big Tomcat during gunnery and his performance against the F-15 Eagle, the Japanese Self Defence Air Force almost switched to F-14s rather than the planned F-15 purchase.

And then there's this account of an F-15C versus a brace of Canadian Hornets. The CF-188s (the Hornet name isn't officially recognised in Canada) uses extra equipment, such as a spotlight in the left-hand side of the forward fuselage to identify intruders at night and a fake cockpit painted under the forward fuselage.

Now, this wasn't new. It had been seen on F-4J/S Phantoms painted by noted aviation artist Keith Ferris. He got together with a number of pilots – including noted TOPGUN instructor C. J. 'Heater' Heatley to come up with disruptive camouflage patterns which would help during close-in dogfighting. One aspect of this was the 'false canopy', painted under the forward fuselage to fool a pilot into knowing which attitude and direction the opposing fighter was at or going in. Some F-4s used this gimmick and all Canadian Hornets do – as do some Fairchild-Republic A-10A/C Thunderbolt IIs.

F-15s stationed in West Germany before the end of The Cold War would learn

to appreciate the 'false canopy' as they would often find themselves taking part in Dissimilar Air Combat Training (DACT) against any NATO elements in the area – and that included the Canadian Hornets then based at Baden-Soellingen.

F-15C pilot Robert 'Scout' Winebrenner was part of the 32nd Tactical Fighter Squadron in Soesterberg, Holland, and he remembers how useful the 'fake canopy' was during a joint mission with a CF-188 flown by Captain Greg 'Claw' Morris.

Winebrenner recalls: "After checking the applicable national regulations, we determined that it was not allowed to fly dissimilar close formation. But there were no prohibitions on dissimilar tactical formations. So we found the best weather on Low Fly Area (LFA) 7 in southern Germany and briefed up a low-altitude VFR ingress through France at slower speed to save fuel, intercepts on target of opportunity in LFA7, and a high-altitude recovery to individual instrument approaches at Florennes."

When they reached the low-fly area, other aircraft were using the zone and both the F-15C and the CF-188 flew several engagements against Phantoms, F-16s and some Tornados. Both the F-15 and F/A-18/CF-188 and their pilots worked well together – but soon Winebrenner realised his 'flying tennis court' was easier to spot than the smaller F-18 Hornet. He realised that at 'the merge' the bogeys would react to the bigger F-15 and then the enemy formation would begin looking for the 'second Eagle' – leaving Morris able to take plenty of close-range missile and gun shots.

This play-through was the same when another pair of Canadian Hornets showed up, they didn't spot Morris in his Hornet and – instead – went two versus one against what they thought was Winebrenner's lone F-15. Laughing, Morris quickly communicated to his compatriots to check their six, as Winebrenner recalls: "Hey, what are YOU doing back there? I'm with the F-15! Fox 2 on both of you!"

Winebrenner retired in 2005 after 26 years in the USAF and he says: "Now my only exposure to the Hornet is watching the US Navy Blue Angels practice over my home in Pensacola. I did note disappointedly that they don't have the fake canopy!"



Not where you want to be! An F-15 in the crosshairs of an enemy's gunsight!



This way up! Or not? This Canadian F/A-18/CF-188 shows the 'fake' canopy off to advantage.



The Vought ASAT weapon was carried on the F-15's centreline pylon.

Satellite killer!

With the F-15's phenomenal climb performance – and with US defence in the 1980s heading in a 'Star Wars' sort of direction, one of the strangest ideas was the use of the Eagle as a destroyer of spy satellites.

In the late 1970s the 'ASAT' or 'Anti-Satellite' mission was looked at, some years before the Strategic Defence Initiative (SDI) which was known as 'Star Wars'. The F-15's ASAT mission would take an F-15, loaded with a single Ling-Temco-Vought ASM-135 ASAT missile and launch it in a zoom climb to take out any offending satellite.

The missile itself was a three-stage guided weapon. The first stage utilised a Boeing AGM-69 Short Range Attack Missile (SRAM) motor and Vought's Aerospace Altair 3 rocket as the second stage. The third stage was the homing vehicle, which – using infra-red – would target and intercept the satellite. Initially the ASM-135 ASAT was built without a warhead – as kinetic energy alone would do the job of destroying the satellite. The ASM-135 was around 18ft long and weighed 2700lb. The launch Eagle had to be fitted with a back-up battery ➤



Retired Major General Doug Pearson and son Capt. Todd Pearson in front of 'Celestial Eagle'.



for the ASAT weapon, a small computer system and datalink for guidance.

The first and only time a satellite was destroyed by an F-15 came on September 13, 1985, when an F-15A Eagle (76-0084) nick-named 'Celestial Eagle' piloted by Major General (then Major) Wilbert D. 'Doug' Pearson Junior took off from Vandenberg Air Force Base, California and destroyed the Solwind P78-1 satellite, which the US had only launched some six years before, but was having issues with depleted batteries.

Pearson was an experienced 'stick' being a test pilot and having more than 4000 flying hours in 50 different aircraft, including (later) the F-22 Raptor, T-38, Northrop F-20 Tigershark, F-4 and F-15, before his retirement in 2005. He also had more than 350 combat hours over Vietnam.

The F-15 was flying straight and level at around Mach 1.2 when Pearson pulled 76-0084 into a 4 g zoom climb at an angle of 65 degrees. At around 38,000ft, with the aircraft's speed decaying just below the speed of sound, the ASAT missile was launched automatically. At 1.42pm, the third stage of the ASAT missile hit the Solwind P78-1 satellite at an altitude of 345 miles, 200 miles west of Vandenberg AFB and at a speed of more than 13,000 miles per hour. The satellite was completely destroyed.

Despite this success, the adoption of the ASAT role for the F-15 (it was thought that the 48th Fighter Intercept Squadron and the 318th FIS were to be so equipped) did not happen. Congress eventually banned further testing of the missile due to a Soviet/US agreement about testing weapons in space and the programme officially ended in 1986.

For 'Celestial Eagle' it wasn't the end and the aircraft was still in service 22 years later, being assigned to the 125th Fighter Wing of the Florida Air National Guard. On the 22nd anniversary of that unique mission on September 13, 2007, Major General 'Doug' Pearson was reunited with the aircraft which was flown that day by his son, Captain Todd Pearson. Celestial Eagle was eventually mothballed at the Davis-Monthan Air Force Base 'Boneyard' in August 2010.

The Vought ASAT weapon being launched from 'Celestial Eagle' in 1985, the F-15's centreline pylon.



The Soviet answer to the F-15: the very capable and long-legged Su-27 Flanker family.

The Soviet Eagle

The kill ratio that the F-15 Eagle has is more than just a number – it's almost sacrosanct. So is suggesting that any Soviet/Russian-built, Chinese or European fighter could take an Eagle down.

With a kill ratio of around 107:0 (depending on stats) both the fighter and strike versions of the Eagle are still seen as being at – or around – the 'top of the tree' when it comes to fighter-versus-fighter combat, but there is one aircraft that casts a similarly large shadow over the F-15... and that aircraft is the Sukhoi Su-27/Su-35 Flanker.

By the late 1970s, a number of new Soviet designs were being seen at the test airfield at Ramenskoye and these were codenamed RAM followed by a number. RAM-L was a Mikoyan-Gurevich design, which became the agile MiG-29 Fulcrum, while the similarly-shaped RAM-K was the Sukhoi T-10, later Su-27 – known as the 'Flanker'. This aircraft was similar in size and purpose to the F-15 Eagle, long-range air-superiority.

Unlike the Eagle – or even the MiG-29 – the Su-27 had a difficult entry into service and was, effectively, one of the last 4th-generation fighters to enter widespread service in the mid- to late-1980s, by which time Fulcrums had often been spotted and intercepted over eastern Europe as well as having visited a number of friendly neighbours.

The Flanker itself features two large turbofan engines – the Saturn/Lyulka, rated in afterburner with around 27,000lb of thrust – a few thousand pounds more than the Pratt & Whitney F100-200 series. Interestingly, more like the F-14 Tomcat than the Eagle, both engines are more widely-spaced on the Russian fighter, meaning that the Eagle has the better asymmetric handling characteristics should an engine be lost.

During development both the new MiG-29 and Su-27 were to have their own powerful pulse-doppler 'look-down/shoot-down' radars, meaning they were less reliant on ground control intercept (GCI) than previous Soviet fighters. The Su-27's weapons fit included a 30mm cannon and a wide-range of air-to-air missiles, including infra-red 'heat-seekers' and radar-guided medium range missiles.

Similarly to the F-15, the weapons fit of the Flanker was improved, so – as the F-15 moved from Sparrows to AMRAAMs and AIM-9L/M Sidewinders to off-boresight aimed AIM-9X Sidewinders, so too did the Flanker see improvements to its missile fit with its own hyper-agile short range missiles and active radar homing medium range missiles.

More importantly the big Sukhoi has probably had the edge when it comes to growth potential in the basic airframe. While the Eagle did transform itself into the Strike Eagle, the Flanker itself also became a strike aircraft. The multi-role Su-30 family perhaps mirrors the Strike Eagle best, while the side-by-side seating Su-34 long-range interdicator was used as a replacement for the swing-wing Su-24 Fencer and had such long legs that the crew of two even had a galley and a toilet positioned behind the cockpit area!

Furthermore, the Su-27 family spawned a number of naval variants (Su-27K/Su-33), suitable for use on Russia's carriers and advanced fighter versions of the basic airframe which incorporate canards and thrust-vectoring (Su-35/37.) Each model has had a modicum of success and around 1700 have been built for more than 12 operators across the globe, including some licence-built in China.

In some respects, the Flanker has had the edge over the Eagle: modern versions,

albeit not yet ordered in any numbers, feature engines with around 32,000lb of thrust and – of course – anIRST (Infra-Red Search and Track) system, where 'radar-off' intercepts can be carried out. Only now is the F-15 fighter community getting such a system. It can also be capable of supersonic speeds at some weights without the use of afterburner – the so-called 'supercruise'. Radar-wise the latest AESA (Active Electronically Scanned Array) radars still hand the advantage of avionics to the Western fighter.

Pure stats show the Flanker to have a 6:0 kill ratio, which isn't a patch on the 104:0 that the Eagle is reported to have. But what would a well-flown Flanker do to an Eagle? You can bet that this has already happened, probably in the skies above the US. It's reported that two Su-27 airframes were purchased from a former Soviet-bloc country and shipped to the USA. These were reported to have been used as 'silver bullet' DACT (Dissimilar Air Combat Training) types for the USAF and US Navy's fighter community. It's thought that many of the Russian systems have been swapped out for Western systems and controls/gauges have changed to English ones.

The shadowy 'Red Hats' squadron has flown captured or procured MiG types since the 1960s. It's rumoured that Lt Colonel Eric 'Doc' Schultz – himself a former and much decorated F-15E pilot and F-35 Lightning II test pilot – may have been killed flying an Su-27-derived airframe in September 2017. Nothing was confirmed, but the fact that it took three days to acknowledge the tragic accident and that the type of aircraft involved wasn't confirmed (other than it was NOT an F-35) raises more questions than it provides answers. ■

Israel's Eagles have been at the tip of the spear since delivery in 1976: half a century ago!



Export Eagles

The all-new McDonnell Douglas F-15 Eagle would have been a logical choice on the export market for existing F-4 Phantom II operators in the late 1970s, but only a few customers could initially pay the price for the early 'pure fighter' version.

During the early 1970s and with the F-15A and B Eagle nearing service entry with the United States Air Force, it was clear that sales could be had on the export market.

McDonnell Douglas was still manufacturing the F-4 Phantom II which was still selling well as – arguably – the world's best air-superiority fighter and was also still producing the latest versions of the venerable A-4 Skyhawk and it would be a

customer operating both of these machines that would become the Eagle's first export customer.

Historically, up until the late 1960s, the Israeli Defence Force/Air Force (IDF/AF) ran on a combination of French-



built machinery, but that soon changed. Israel had turned to France for its combat aircraft from the mid-1950s, purchasing the Dassault Mystere IVA in 1956 which stayed in service until the 1970s.

Other French-built aircraft included the Fouga Magister jet trainer, the Dassault Super Mystere – first delivered in 1959 – and the Dassault Ouragan, which saw service during the Suez Crisis. Of all the French military aircraft used by the Israeli Air Force, the most famous was the Dassault Mirage IIICJ which was a spectacular success during 1967's Six-Day War.

The United States had – up until now – blocked the sales of military equipment to Israel, apart from 'defensive' systems such as the HAWK surface-to-air missiles which were sold to the IAF in the early 1960s, but – finally – in 1967 the go-ahead was given for the newly-merged McDonnell Douglas to sell a purpose-built version of the A-4 Skyhawk, the A-4H, to the Israelis. For the IAF this was a big move. The Skyhawk would be a perfect replacement for the ageing subsonic French jets now used in the air-to-ground role and the aircraft itself was well-proven in Vietnam.

The A-4H model – called 'Ayit' or 'Eagle' in Hebrew – was basically an A-4E, with an improved J52-P-8A engine, different avionics and two DEFA 30mm cannon in

place of the original E-model's Mk 12 20mm Colts. The IAF would become the second largest operator of the Skyhawk after the United States and they would upgrade the aircraft in many ways, including fitting the dorsal 'camel hump' avionics spine and an extended jet pipe designed to fool heat-seeking missiles.

Around 90 H-models were delivered and augmented in 1973 with the A-4N model, a derivative of the US Navy/Marine's improved A-4M 'Skyhawk II' as well as two-seat versions. The type was finally retired in December 2015.

The choice of the A-4 finally meant that Israel didn't have to rely completely on France for military aircraft – which was handy as during the late 1960s the French placed an embargo on sales to Israel. This embargo meant the IAF did not get the Mirage Vs it had ordered, the Mirage V being a simplified version of the Mirage III that was more suited to Israel's needs. Instead, Israel courted the US still further and pressed ahead with its own indigenous fighter-bomber based on the design of the Mirage V, which would lead to the Nesher/Dagger and Kfir strike fighters.

Phantoms for Israel

By 1969 the US had decided to allow the Israelis to purchase top-line McDonnell Douglas F-4E and RF-4E aircraft. The ➤



Many of the original F-15A/C-B/D Baz fleet have led hard and successful lives in combat since 1979.



The latent strike capability in the baseline single and two-seat fighter Eagles has often been exploited by the IAF.



Large numbers of Israeli 'Baz' airframes have historic air-to-air kills marked on them.



Despite many updates over almost five decades of service, some of the IAF's Baz fleet look decidedly worn!

F-4E cost around four-times that of the little Skyhawk and was then the best multi-role fighter in the world. The F-4E was called 'Kurnass' (Heavy Hammer) in Israeli service and would keep air-superiority for the IAF in the Middle East, joining the fight during 'The War of Attrition' and taking heavy losses during the Yom Kippur War. The last Kurnass was retired in 2004.

As the 1960s came to a close, the IAF knew that they had to have an eye on the future when it came to new fighter aircraft, more so when the new decade dawned and the Soviets began to fly MiG-25 reconnaissance aircraft over Israel from 1971. Initially the Israelis would work with the US/McDonnell Douglas on trying to develop a higher-performance F-4 model – known as the F-4X: this had uprated J79 engines equipped with water-cooling, allowing for higher cruising speeds and a top speed of around Mach 3.2. While this would be a solution for Israel, by the early 1970s an updated and uprated F-4 Phantom II would or could spell disaster for the F-X/F-15 programme back in the USA.

The IAF soon had its own team looking at future fighter aircraft designs, while at the same time diplomatic overtures were being made to Washington in a bid to ensure that they wouldn't have to wait for eight years (as they had with the Phantom) before getting the chance to purchase any modern US fighter design. Meantime, Israeli Aircraft Industries pressed on with the J79-powered Kfir Mirage derived strike-fighter and even looked ahead to its own, more modern design which – in the 1980s

– became the IAI Lavi. Senior figures in the IAF knew that any Israeli-designed and built aircraft would take some 10 or more years to develop and even then it would have to use avionics, parts and engines from the West.

The US was always trying to ‘tread carefully’ in the Middle East during the 1970s in an effort to ensure and maintain the balance of power in the region. Following the Yom Kippur War ceasefire in October 1973, the UN-backed agreement between Israel and Egypt in January 1974 and then the subsequent Israeli withdrawals and second disengagement agreement signed in September 1975, the portents were good that Israel would be looked upon favourably by the US government on any potential 4th generation fighter purchase.

The requirement was for around fifty 4th generation fighters to see the IAF through to the 1990s – perhaps beyond. In June 1974 the country’s minister for defence – Shimon Peres – requested that a small cadre of experienced IAF pilots be allowed to test and evaluate the two main contenders to such a purchase. Those candidates would be the Grumman F-14A Tomcat and the McDonnell Douglas F-15A/B Eagle.

By this time the F-14A had already been evaluated and ordered by the Iranian government – the Shah (a pilot himself) having supposedly been impressed by the aircraft’s performance. This order wasn’t an issue... until the 1979 revolution. A



Fighter versions of the Eagle replaced the BAC Lightning in RSAF service, giving the kingdom a quantum leap in performance over the British aircraft.

key difference between the F-14 and F-15 was that the Tomcat was built around the AIM-54 Phoenix, a 100-mile range missile designed to give the F-14A the reach to defend naval surface forces against long-range Soviet bombers and cruise missiles. In the right hands it could also dogfight. The F-15, in contrast, was designed for air-superiority over the battlefield – something that appealed to the Israelis given the nature of the battles they had fought since

independence in 1948 – but both would be evaluated thoroughly.

IAF commander Benny Peled had flown one of the first TF-15s in 1974, but this was a pre-production jet, so many of the systems that would make it combat-ready had not actually been fitted. Meanwhile, David Ivry (a former P-51 Mustang and Dassault Ouragan pilot for the IAF) had also flown a Tomcat while visiting Naval Air Station Miramar. He’s reported ➤



Resplendent in their special schemes, the RSAF’s Eagle variants are joined by their Panavia Tornado and Eurofighter Typhoon aircraft.



Japan licence-produced the F-104 and F-4 for JASDF use. They also produced a number of indigenous aircraft such as the Mitsubishi F-1 and would go on to be the only licence builder of the F-15. They would even build the P&W F100 engine.

to have been impressed with the F-14, if a little disappointed that the troublesome TF30 turbfans had to be treated with care during air combat manoeuvres against a US Navy A-4 Skyhawk.

A team was eventually put together to evaluate both machines independently as the US had not allowed the Israelis to actually pitch Tomcat against Eagle. The evaluation team would be led by Amnon Arad – a former Mirage pilot and F-4E pilot and squadron leader. He would be joined by Assaf Ben-Nun (former fighter pilot and test pilot for the Kfir project), Omri Afek – an F-4E pilot, Israel Baharav – former Mirage pilot and squadron commander during the recent Yom Kippur War and navigator Aharon Katz. The rest of the team included ground crew and employees from Israeli Aircraft Industries.

The evaluations would make for interesting reading at the time – coming from the most experienced and battle-hardened jet fighter pilots then seen: these pilots had around 24 kills between them. They wanted to see how these teen-series jets dealt with everything from low and slow targets to fast targets replicating the irritating MiG-25Rs that were making nuisance flights over Israel.

Around 10 flights were made in the two-seat F-15 – a full-scale development aircraft with the new systems on board – as well as extensive use of the McDD F-15 simulator. Sorties were made against both A-4 and F-4 aircraft and the Israelis came

away impressed with the F-15 especially. They found that the F-15 could easily best both aircraft, that the weapons systems were ‘user-friendly’, that the agility of the Eagle was astounding and that the power allowed them to ‘sustain G’ like nothing else they’d flown before. The cockpit also gave unrivalled visibility for dogfighting.

In comparison, the team were disappointed in the dogfighting ability of the two-seat F-14 which they flew at Miramar. Often it was found that an air combat manoeuvring mission against the humble A-4 Skyhawk could end up in a stalemate. It soon became clear that the F-15 Eagle was the best choice for the IAF and – better still – the aircraft was some millions of dollars cheaper per unit than the Tomcat.

Politically though, issues over an F-15 sale would not be cleared until that second disengagement agreement of September 1975, but then within a month the US agreed to supply the Eagle in numbers. Under the terms of the agreement, entitled ‘Peace Fox I’, Israel began receiving its new fighter in the form of four full-scale development aircraft in December 1976, followed by the delivery of two F-15Bs and 19 F-15As under the terms of Peace Fox II.

This would cost Israel around \$625 million and was superseded by Peace Fox III under which 18 F-15Cs and eight F-15Ds were ordered. In addition – during the early 1990s – following Israel staying its hand during Desert Storm when it was attacked by Iraqi Scud missiles, the IAF was sent 10

early F-15A and Bs which were refurbished as a ‘thank you’ by the US government.

Israel’s investment in the F-15 Eagle proved to be well worth it, as we shall see and the ‘pure fighter’ Eagles would later be joined by the multi-role versions based on the Strike Eagle platform and news that the original Baz airframes could well be replaced by the second-generation ‘Advanced Eagle’ models.

Saudi Eagles

By the end of the 1970s, the Royal Saudi Air Force was in need of a fighter to replace the notoriously short-legged BAC Lightnings which were originally delivered in 1967 and would stay in service until 1985.

Traditionally, the RSAF used a mix of British/European and American warplanes and by the early 1980s that trend seemed set to continue, with Riyadh expressing interest in both the Eagle and both versions of the European Panavia Tornado. This was a political necessity forced upon the RSAF thanks to the ‘will we, won’t we’ attitude of President Jimmy Carter’s administration – at senate level it had to be explained that any RSAF F-15s would be used ‘defensively’ rather than against – say – the Israelis.

With the Israeli Air Force receiving their F-15s in the late 1970s – and despite political pressure at home – it was eventually deemed fit to supply 47 F-15Cs and 15 F-15Ds under ‘Project Peace Sun’, and these were to be a direct replacement for the BAC Lightnings which by ➤



The original F-15 order of single and two-seaters gave Japan’s Self-Defense Force enormous capability, even with some original systems being replaced by Japanese-built ones, and home-grown air-to-air missiles.

Since introduction into service, a number of F-15J (single-seater) and DJ (two-seater) aircraft have been seen in some stunning paint-schemes.



now had relinquished their air-to-ground roles and were used as pure interceptors. Deliveries began in early 1981 and the F-15s were declared operational later that year.

In the meantime, Ronald Reagan replaced Carter in the White House and that marked a big change when it came to selling advanced arms around the world. Suddenly a 'watered down' version of the General Dynamics F-16, powered by the F-4's J79 engine was replaced by top-performing F100-powered F-16As for export. Also, the US sold five Boeing E-3 AWACs (Airborne Warning And Control) aircraft, six Boeing KC-135 air-to-air tankers, advanced missiles and the Conformal Fuel Tanks (CFTs) originally kept out of the first Peace Sun deal, in case they were used to extend the F-15's range for attack missions. The sum total was billions of dollars and this regime change

in the Oval Office extended to Israel as they could finally export their own IAI Kfir, equipped as it was with an American J79 engine and they themselves could order extra fighters.

The further export of F-15s to Saudi Arabia in 1983 was a hot enough potato for Congress to block the sale, effectively pushing the RSAF to select the RAF's Interdictor Strike (IDS) version of the Tornado as part of the first 'Al Yamamah' arms deal of 1985, which also covered the Air Defence Variant (ADV) Tornado and Hawk trainers and associated weapons and equipment.

Saudi Arabia's original 'Peace Sun' order would be fulfilled by May 1983, with the last two of the 62 on order being attrition replacements. Then in October 1987 a further order of nine F-15C and three F-15Ds under 'Peace Sun VI' were ordered but these would not be delivered

until February 1992 and after the Gulf War – although in the meantime, 24 used examples would be transferred to the RSAF during the summer of 1990. It is thought that these original air-to-air only fighters will be replaced either with Eurofighter Typhoon aircraft or later versions of the multirole Eagle.

Far Eastern Eagles

Since the Second World War, Japan has played a key role in the prosecution of the West's anti-communist policies. From its use as a staging post and base during the Korean War, through to the alarming shoot-down of the KAL007 airliner shoot-down by a Sukhoi Su-15 in 1983, to today's increased tensions in the area, with both Chinese and Russian jets probing their defences: Japan's 'Self-Defence' forces have had to be ready.

For the decades preceding acceptance of the F-15 Eagle, Japan had a proud



tradition of not only using their own, indigenous designs, but also of producing top-line fighter aircraft from the United States under licence.

Japan's military aviation industry designed such capable aircraft as the Fuji T-1 and T-5, the Kawasaki T-4 and Mitsubishi F-1/T-2 while also licence-producing the F-86 Sabre, F-104 Starfighter, F-4 Phantom and – eventually – the F-15 Eagle.

During the early 1970s, the then-Japan Defence Agency (since renamed as the Ministry of Defence) looked at 13 possible aircraft to replace its Lockheed F-104J/DJ Starfighters, ordered back in 1960, and F-4EJs ordered in 1968.

Such was the pace of the selection process that the Japan Air Self-Defense Force (JASDF) sent a number of pilots to Edwards Air Force Base during June/July of 1975 to evaluate the F-15A and B aircraft.



With upgrades to see them through to mid-2050, it will be a long time before the sun sets on Japan's relationship with the F-15 Eagle.

By the end of 1975 the F-15 Eagle was announced the winner of the competition to find a new Japanese defence fighter, called 'Peace Eagle' by the US.

With a few nations licence-building the F-104 (including Japan) and Japan licence-building the F-4EJ, it stood to reason that the Japanese aircraft industry would want to do the same with any selected fighter. With the government of Japan intending on initially having around 187 F-15 single and twin-seaters, it was announced in 1978 that Mitsubishi Heavy Industries would be the primary contractor for the production of the F-15C/D models – designated F-15J and DJ.

Eventually 223 aircraft would be acquired – 203 J model single-seaters and 20 DJ twin-stickers. Two F-15Js were built by McDonnell Douglas at St Louis, with 12 DJs built in the US. The first F-15J flew in June 1980 before being sent to Japan and then eight F-15Js in large 'kit' form were shipped to Japan for final assembly, with the first of these flying in August 1981. From then all of the aircraft earmarked for Japan were licence-built and the first four squadrons to see service with the new fighter replaced the ageing F-104J Starfighter, with the Rinji F-15/202 Hokotai (basically a Japanese F-15 'operational conversion unit') the first to receive aircraft and form at the end of 1981.

When it came to the F-15J/DJ models, changes would be made to the design of the C/D Eagle – mainly due to the sensitive nature of certain items of equipment, mostly electronic countermeasures (ECM) kit, nuclear capability (still a factor on the early-model fighter versions of the F-15 Eagle) and the radar warning receiver (RWR). To this end, the AN/ALQ-135 ECM suite of the US Eagle was eventually replaced with the Japan-derived J/ALQ-8, while the RWR fit in Japanese Eagles was taken care of by the J/APQ-4 system, collectively known as 'JTEWS' or the Japanese Tactical Electronic Warfare System. The Pratt & Whitney F100 engine was also licence-produced in Japan by the IHI Corporation.

Upgrades on the basic JASDF J (single-seater) and DJ (two-seat) aircraft began in 1987 with introduction of the basic USAF MSIP or Multi-Stage Improvement Programme. This saw the introduction of the P&W F100-PW-220 (again, licence-produced), an upgraded ECM suite, new computer systems, and upgraded J/ALQ-8 ICS system with a new antenna mounted under one of the engine intake trunks.

Upgraded and indigenous weapons also were absorbed by the F-15J/DJ force, including the upgraded Japanese-built AAM-3 missile, based on the AIM-9 Sidewinder, but with twin forward fins. Later upgrades of the F-15 fleet included uprated engines, new ejector seats, computer changes, introduction of the AAM-4 missile (similar to the US AMRAAM) and bringing the Raytheon AN/APG-63 radar more up to date. From around 2010, plans were put in place to make further upgrades, with helmet-mounted sights, a new AAM-5 short-range highly-agile missile and a full datalink system, meanwhile earlier JASDF plans to make an 'RF-15J' to replace the ageing RF-4E Phantoms were cancelled around the same time.

By the end of 2022, it was confirmed that 68 single-seaters would be upgraded as part of the Japan Super Interceptor Programme (JSI). The upgrades would include a new AESA (Active Electronically Scanned) radar, upgrades to the various computer systems, and more advanced and longer-ranged weapons systems, vital over the expanses of the Pacific region. These along with airframe updates should see the original J fleet through to the 2050s.

While other air forces are looking at the second-generation F-15EX Eagle II/Advanced Eagle variants, it seems – for now at least – that the Japanese will update their Eagles while Lockheed Martin F-35 deliveries continue and they invest in the collaborative GCAP (Global Combat Air Programme) project with the British and Italians. ■



As a replacement for the General Dynamics F-111, it was initially expected that the F-15E Strike Eagle would spend a lot of its time 'down in the weeds'.

Making the Mud Hen

The F-15E Strike Eagle has a number of nicknames: Beagle (for bomber Eagle), Mud Eagle and Mud Hen. Slightly derisory for a strike aircraft that has provided the bulk of the USAF's cutting edge tactical strike force for almost four decades.

'Not a pound for air-to-ground' was an adage bandied about in the Pentagon during development of the original fighter variant of the F-15 Eagle.

It was a call to make the Eagle an unadulterated pure fighter, something that – following the Vietnam War – many in the USAF felt was needed to beat those pesky MiGs.

Of course, the F-4 Phantom had been pulling double duty since the start of that

conflict – and more. Both Navy and Air Force F-4s dropped bombs and napalm, fired rockets, engaged in Combat Air Patrols (CAPs) target combat air patrols (TARCAPs), went on escort missions, took part in 'Iron Hand' anti-surface to air missile missions, and did close-support missions, often dropping ordnance within metres of their own troops. Specially configured reconnaissance RF-4Bs, Cs and Es would streak across the skies giving much-needed pre- and post-strike photography and intel.

Back at the start of the F-15

programme, a degree of latent air-to-ground capability was installed in the basic airframe – indeed such systems would later be used by the Israeli Air Force at the start of the Eagle's combat career – but the USAF chose not to use it.

Plans were laid throughout 1975 and 1976 to realise the Eagle's air-to-surface potential prior to official service entry, but two factors ensured that this potential would be set aside. The first was issue was weapons capability. During trials, a number of sorties were made with the F-15A/B in



air-to-air fit but with Mk.82 dumb bombs. This was a loadout considered the 'norm' for F-4 Phantoms in Vietnam. F-15s were eventually cleared for air-to-ground Mk.82 delivery up to 700 knots from 0.5 to 7.33G with up to 15,000lb of ordnance under the wings. Reports from the time say that the F-15A and B models would be on a par – accuracy wise – with anything currently in the USAF inventory, but there were reportedly software issues to overcome.

Had the USAF been sufficiently determined, software issues with weapons compatibility would soon have been overcome. But there was another even more intractable sticking point: pilot shortages. During late 1975, concerns began to be raised about the length of time it was taking to train pilots to fill slots in F-15 squadrons. It was therefore decided that from early 1976 the air-to-ground sections of the flight training schedule would be deleted, meaning that the F-15 would be the first USAF fighter since the end of the Second World War without a secondary surface attack role. Things would change though...

Enter the Strike Eagle

By the end of the 1970s it was almost an ultimate irony that USAF planners were

looking once more to 'multirole' aircraft, especially in the ground-attack role.

Even by the mid-1970s, on introduction to service the General Dynamics F-16 Fighting Falcon had shown its mettle in bombing competitions across the world and shown itself to be a peerless air combat fighter. In effect, aircraft like these could fight their way into a target, bomb and then get the hell out again.

Other USAF attack aircraft such as the A-7 Corsair II and F-111 generally needed escorts, while older 'multirole' aircraft languishing in the Air National Guard such as the beloved F-105 Thunderchief had also shown themselves to need fighter escort when laden with bombs. As technology improved, so did accuracy and more could be done with a smaller bombload, which could be carried by smaller fighter-bombers. If the F-16 could be made into a useful attack aircraft, surely the larger and more powerful F-15 could do even better?

The USAF began to look into a number of studies to see what form a future strike aircraft would look like. In 1978 the USAF began the 'Tactical All-Weather Requirement Study' (TAWRS) which looked at the possibility of buying more F-111s, with some upgrades, or purchasing reworked versions of existing fighter ➤



The long-serving two-seater 71-0291 was the basis for the prototype 'Strike Eagle', complete with a moody 'European One' wraparound camouflage scheme.



The original A/B models had some latent air-to-ground capability as shown here on a development machine. They were cleared for the ubiquitous Mk.82 bombs, up to 700kts, 15,000lb and reports said they were as accurate as any dedicated attack plane then in USAF service.



Originally cast as a 'multirole' fighter – and interceptor for the US Navy – the mighty General Dynamic F-111 was most certainly none of these things. Although it did mature into a fast and deadly low-level tactical and strategic bomber, as well as an electronic warfare platform, as shown by this formation of F-111s and an EF-111 'Spark Vark'.



In competition with the Strike Eagle concept was the quirky 'cranked-arrow' winged F-16XL, which – if successful – would have come in single (E) and two-seat (F) versions.

airframes instead – including the F-15. By 1981 this had become the 'Enhanced Tactical Fighter' programme (ETF) which ostensibly would replace the F-111 in the long-range tactical-strike, low-level, bad-weather interdiction role.

From these early studies, two aircraft would come forward and battle it out to win the contract: the F-16XL and the F-15E Strike Eagle. The Panavia Tornado was briefly considered for the USAF but this really was a non-starter.

The F-16XL was based on the 'cranked-arrow' winged basic F-16, but the new wing gave the Falcon much higher internal fuel capacity and more weapons stations. The F-15 Strike Eagle would be based on the F-15B/D two-seat airframe, with extra fuel carried on what previously were known as

'FAST' packs (Fuel and Sensor Tactical) but were by now – in effect – simply CFTs or Conformal Fuel Tanks. These would hug the side of each intake trunk, adding 2800 litres or 750 gallons of fuel, while simultaneously carrying six weapons pylons. This CFT system produced much less drag than using normal drop tanks – even if the CFTs could not be jettisoned.

By the late 1970s, McDD had plenty of knowledge in the design of strike/attack multirole aircraft thanks to its work on the navalised F-17 Cobra – by now called the F/A-18 Hornet. This was also a machine intended to fight its way to a target, destroy it and get home again on its own. The USAF wanted an aircraft that didn't need other escort fighters and that had powerful radar and avionics so it could find the target at

night and in any weather, destroy it and have self-defence systems to avoid surface-to-air missiles and anti-aircraft guns.

The F-111 of the time (mid-1980s) had matured into a potent warplane, was blooded in the Vietnam War (if a little unsuccessfully) and was a true 'Cold War warrior', being based in the UK to oppose any Soviet threat. By the time the F-111F had entered service, with its AN/AVQ Pave Tack laser-designator pod, taking part in April 1986's 'El Dorado Canyon' mission against Libya, the Aardvark had a true precision attack capability and – with its variable geometry, highly-loaded wings – gave the side-by-side crew of two a very smooth ride at low-level, the only altitude at which attacks were considered to be made successfully in the 1980s. ➤



The front of the F-15E cockpit is dominated by a wide-angle HUD and a number of TV displays. The WSO's rear workstation also benefits from large multifunction displays.

However accurate the F-111 was with weapons delivery, it needed support in the form of 'Spark Vark' EF-111 electronic countermeasure aircraft and escorting fighters: because while it was very fast 'on the deck' the General Dynamics machine was no dogfighter, having only a limited armament. Early F-111s could carry a

removable 20mm M61 Vulcan cannon and had provision for AIM-7 Sparrow radar-guided missiles – but this was never used operationally. Instead, the ubiquitous AIM-9 Sidewinder was the self-defence weapon of choice.

With the prospect of replacing/ augmenting the F-111 in the late 1980s –

not to mention the thought of replacing multirole configured F-4Es in USAF service alone, as well as the potential for export – McDonnell Douglas and Hughes (later Raytheon), looked into the use of a twin-seat F-15 tailored to complete the long-range strike/interdictor mission, but while keeping all of the F-15's impressive air-to-air power. This would initially be a privately funded programme, and the airframe that would be used for development would be the hard-working second F-15B: 71-0291. It would be a testbed for some ideas whereby the cockpit especially would receive some serious updates to help reduce the two crew's workload.

While the competing F-16XL was considered in both single (F-16E) and two-seat (F-16F) versions, the Strike Eagle was always going to be a two-seater in its early, non-export form. In the back would be a 'Whizzo' or Weapons Systems Officer, also known as the 'pitter' due to their 'pit-pit-pit' button pushes (or their constant 'pit-pit-pit' stream of verbal updates).

Hughes went to work on developing the existing AN/APG-63 radar, creating the multi-mode AN/APG-70 synthetic-aperture radar. This measures and uses the Doppler shift, which is created when the radar waves hit an object or the ground and are reflected back to the antenna. The computer then uses this information to create either a two- or three-dimensional image of the landscape, including ➤



Clearly seen here are the Conformal Fuel Tanks (CFTs) upon which ordinance can be carried. Also, on the intake trunks is the two-pod LANTIRN navigation and targeting system.



The high workload is split between the pilot and 'Whizzo', who also has some basic flight controls. With the high-G airframe, rumours are that more than one WSO has saved the lives of both, following the pilot succumbing to G-LOC.



Improved F100-PW-220 engines from Pratt & Whitney were used in the Strike Eagle – power was up by 20%.



The Strike Eagle has a number of self-defence systems – not least its ability to engage any enemy aircraft on equal terms. The baseline E is at least as good in a fight as the updated C models.

targets such as bridges, airfields and roads which could be scanned and seen in cockpit displays from around 100 miles away. As the range decreases the crew in the cockpit can then make out individual targets such as tanks, trucks and parked aircraft.

To aid in the 'stealth' of the attack-configured Eagle, the power of the AN/APG-70 lies in its ability to do a quick scan of the target area and then shut down, while the image of the target itself is still available to the crew. This is important, considering the 'swing' role of the aircraft – where it needs to move between air-to-air and air-to-ground in an instant. The radar not only allows the crew to detect ground targets at long range, but the 'freeze-frame' of ground targets then allows the crew to go back into air-to-air mode, leaving the pilot to scan for those threats while the WSO targets ground threats.

Aiding targeting was (initially) the Pave Tack pod, similar to that used on the F-111F in its bomb bay. In fact, the company demonstrator used this when it went to Farnborough in 1980. This was soon replaced by the more elegant twin-pod Martin Marietta (now Lockheed Martin) LANTIRN or Low Altitude Navigation and Targeting Infra-Red for Night pods. This used the AN/AAQ-13 navigation pod (hooked on the right forward intake trunk of the F-15) and the AN/AAQ-14 targeting pod on the left intake trunk.

Information from the pods could be

shown on one of the large, multi-function screens in the F-15's cockpit (three in the front – two of which were monochrome and one colour: four in the rear, two of which were colour) while the FLIR images (Forward Looking Infra-Red) allows high-quality 'daylight' imagery to be projected onto the F-15E's wide field of view (WFOV) head-up display. This could also be seen in the rear seat by the WSO as a 'HUD repeater' so he sees what the pilot sees.

The WSO uses the screens to glean information from – not just the radar – but also to check the electronic warfare equipment and defence systems. It also helps them to get the best out of the various air-to-ground and targeting systems and has two control sticks with which to manage the workload.

The displays can be swapped from one screen to another (often a matter of preference from one Whizzo to another) and the back-seater also has a limited set of flight controls, in addition to the two side-control sticks. This includes throttle (no HOTAS controls) a joystick, rudder pedals, compass and other basic instruments, including dropping the landing gear.

It's rumoured that more than one WSO has taken control of an F-15E when they thought the pilot had succumbed to G-LOC.

The LANTIRN system itself can be linked to the aircraft's FCS (Flight Control System) to allow low-level terrain following 'hands-off' at night and in all weathers. The

development of both pods was lengthy, beginning in 1980 and ending in 1987 when the first pod was delivered to the USAF – long after the F-15E had been chosen as the winner of the competition.

Airframe development was ahead of that of the targeting pods, but many changes had led to the Strike Eagle being heavier even as a basic airframe, with associated strengthening of the airframe, landing gear and emergency arrestor hook as a result.

McDonnell Douglas gave the E-model a 16,000-hour fatigue life (around twice that of the original F-15A) and the avionics and engine bays were redesigned – partially as a nod to future use of the General Electric F110 engine. This part of the aft fuselage utilised advanced engine bay structures made from 'Superplastic Forming and Diffusion Bonding' tech. This is where metal sheets are welded together at their very edges, heated in a mould and then an inert gas is injected between the sheets to fit the mould itself. This system helps make complex structures that are very strong.

Also internally, ammo carriage space for the internal General Electric M61A1 Vulcan cannon was reduced, so the number of rounds went down to 500 rounds in the Strike Eagle from 940 rounds in the F-15C.

The new F-15E benefitted not only from improvements to the radar, but Pratt & Whitney had also used the updated F100-PW-220 from the F-15C/D as the

initial engine of choice for the early F-15Es, before the more powerful F100-PW-229 motor (29,000lb thrust, so up by 20%) came on stream in the early 1990s. There was a chance that the General Electric F110 was to be used – thanks in part to those engine bay changes for installation/plumbing commonality – but all USAF F-15E Strike Eagles would be Pratt & Whitney powered, while later Strike Eagle variants for export would use GE's F110.

Strike Eagle wins the fight

During the early 1980s the two main protagonists were evaluated. From 1981 until the end of April 1983, the F-15E Strike Eagle demonstrator went up against the F-16XL.

During this evaluation phase, the four F-15E demonstrators made around 200 flights, with a wide variety of the then in-service USAF weapons in 16 differing configurations, with take-off weights of more than 75,000lb. To compare, the F-15C has an empty weight of 28,000lb, loaded weight of 44,500lb and a maximum take-off weight of around 68,000lb. On entry into service the empty weight of an F-15E Strike Eagle would be around 31,700lb with an MTO of an impressive 81,000lb, but still somewhat shy of the F-111F's 100,000lb!

While the interesting F-16XL was clearly a remarkable aircraft, a number of factors led to the announcement in February 1984 that the F-15E Strike Eagle

was the winner. Those factors included the perceived (if not proven) twin engine safety, future growth potential and lower development costs thanks to using the already proven (if somewhat modified) basic F-15 airframe. The USAF would eventually look to buy 392 examples of the new Strike Eagle, with the first being built in 1985 and 86-0183 making the type's first flight in July of that year. USAF trials with the new aircraft began when the 33rd Tactical Fighter Wing at Eglin Air Force Base, Florida received its first aircraft, ahead of the 4th Tactical Fighter Wing at Seymour Johnson AFB, North Carolina converting from the McDonnell Douglas F-4E Phantom II at the end of 1988.

Strike Eagles began to fill squadrons from early 1989 onwards and ominously many squadrons' operational dates would – after many months of hard work-up training – end up at around the August 1990 date when both the Eagle and the Strike Eagle would go to war with the USAF.

So how did the aircraft compare to those that it was destined to replace? Both the F-4E and F-111F were retired in the same year – 1996 – and there were many differences. Firstly, the Strike Eagle was a league ahead in self-defence. The F-15E's TEWS or Tactical Electronic Warfare System meant that all countermeasures were fully integrated on the aircraft. The Eagle's Radar Warning Receivers, electronic and chaff/flare dispensers – as

well as any ECM pod hung up on the F-15's pylons – were linked with the TEWS to allow all threats to be prioritised and dealt with.

Going on the offensive defensively meant that the F-15E would utilise the basic airframe's agility and the improved (and more reliable) power from the Pratt & Whitney F100-220 engines.

Initially late L/M versions of the AIM-9 Sidewinder were the trademark self-defence missiles until the widespread introduction of the AMRAAM (Advanced Medium Range Air-to-Air Missile). It was thought that the air-to-air capabilities of the F-15E Strike Eagle were at the very least a match for the F-15C MSIP (Multi-Stage Improvement Programme) updated fighter Eagle and – thanks to increased thrust – the aircraft would have extremely similar performance characteristics, so that means prolonged high-G agility and a maximum of 9G positive and a thrust to weight ratio of around 0.93.

By comparison, the F-111 had (at best) a meagre 0.61 thrust to weight ratio from the TF-30 engines. Oh, and the F-15E had a second set of eyes in the back seat, operating out of a blown canopy too, to call out the bogeys on their six o'clock, rather than the Aardvark's side-by-side seating arrangement with much less forward and rearward visibility.

For the low-level role in which it was originally envisaged, the F-15E was a ➤



Strike Eagles have now been in service for almost four decades.



At such altitudes the heavier Strike Eagle's agility is still useful for the avoidance of SAMs as well as engaging in defensive air-to-air combat.



The Strike Eagle's systems and weaponry have been constantly updated over the years.



The Strike Eagle will be a common sight at USAF air bases for some time to come.

different animal to the F-111 it was looking to complement and later replace. The F-111 had something of a 'magic carpet ride' down on the deck, thanks to its high wing loading: this is the amount of weight per square area of wing. The higher this is, generally the smoother the ride is and more 'buffet free'. With wings spread forward, the Aardvark had a 126lb per square foot wing loading (615.2kg per square metre) while with the wings fully swept, this rose to 158lb per square foot (771kg per square metre).

In comparison the Strike Eagle's wing loading was 112lb per square foot (or 546 kilos per square metre) and interestingly the old F-4E's sat at around the 78lb per square foot (380 kilos per square metre). For the F-15E, this meant that the ride wasn't quite as plush down low, and – with the wing being designed from the outset for fighter-like agility – it suffered as a result.

But there was no questioning which machine was more accurate – F-4E, F-111F or F-15E Strike Eagle. In June 1990 – just months before the Strike Eagle would go to war – the USAF held a gunnery meet at Davis-Monthan Air Force base and the new Strike Eagle beat the old-hands from the service to take the top two spots. Things

would improve still further as pilots got to learn more from their aircraft and its systems.

Further upgrades

Following its combat introduction in Desert Storm, the Strike Eagle community has been at the tip of the spear when it comes to deployment to any hot spot around the world.

As a result, the capabilities of the base airframe have been constantly improved thanks to new avionics, engine upgrades and the like. Some updates have come via lessons learned on export orders of the F-15E – or simply via necessary upgrades to keep the USAF's own fleet relevant and up-to-date.

The field of radar technology has come on in leaps and bounds over the last 36 years since the original introduction of the F-15E Strike Eagle and its Hughes/Raytheon AN/APG-70 system. Originally called AN/APG-63/(V4) until 2009, the AN/APG-82 (V1) is a brilliant 'parts bin special', combining the processor of the AN/APG-79 used on Boeing's F/A-18E/F Super Hornet with the AN/APG-63 (V3) AESA (Active Electronically Scanned Array) antenna

from the F-15C fighter. Along with other upgrades including cooling and resistance to electronic warfare jamming, the new radar has been introduced fleet-wide, airframe-by-airframe in the USAF since 2010.

The future

The USA's recent operations in Iran have shown that the F-15E Strike Eagle is still one of the most important combat strike aircraft the United States can field.

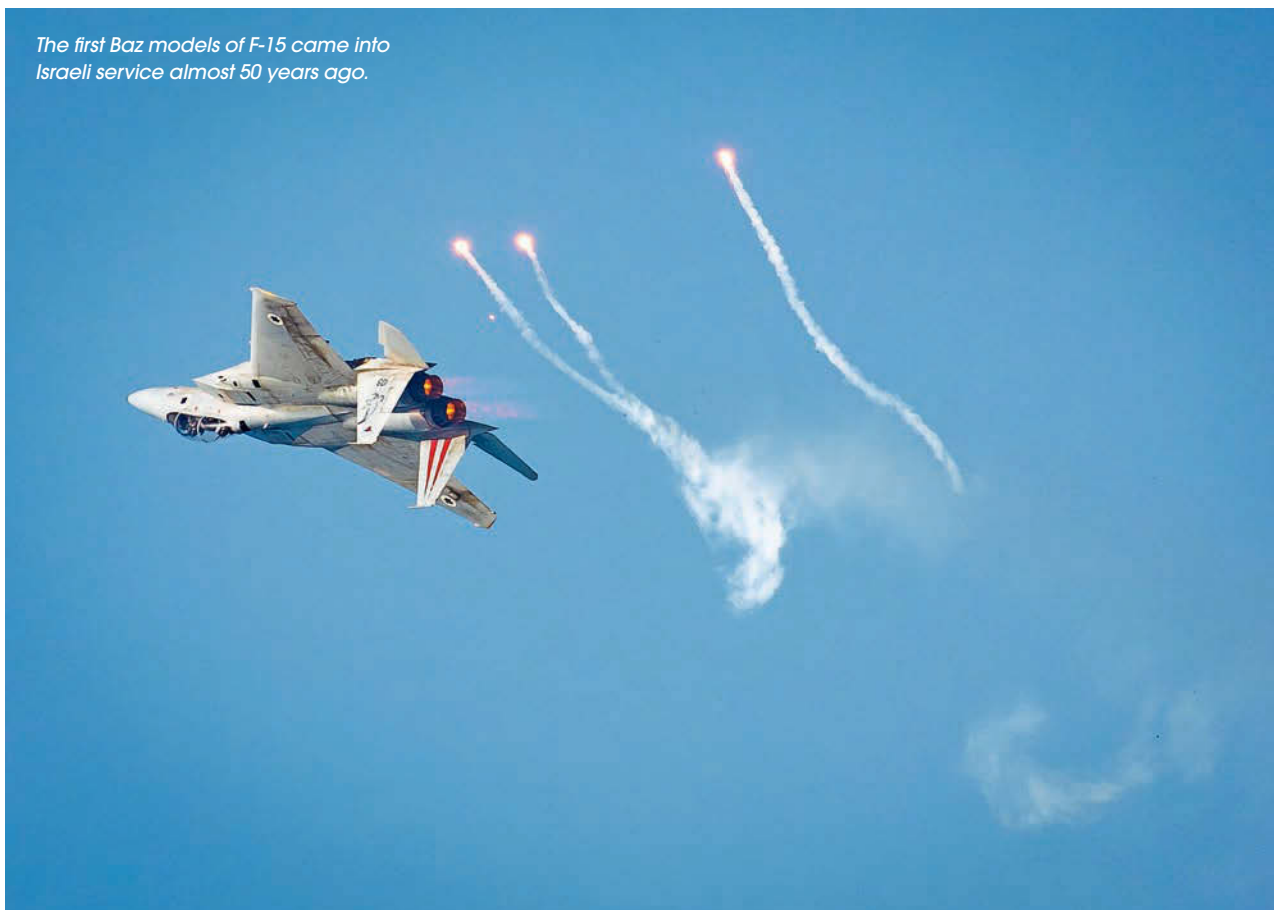
Current plans are aiming to keep smaller numbers of the Strike Eagle in service into the 2030s and possibly into the 2040s. Around 100 of youngest airframes in the current fleet (those with the F100-PW-229 powerplants) are likely to be modified by receiving the Eagle Passive/Active Warning Survivability System (EPAWSS) and the upgraded AN/APG-82 AESA radar. Other improvements will be weapons-based, but also would include the use of more advanced targeting sensors and communications systems and possibly even some form of poddedIRST (Infra-Red Search and Track) system.

The outlook then is positive for the Strike Eagle, which will see a smaller force still in service for a decade or more. ■

Eagle: air-to-air

No other aircraft has such an outstanding record in the arena of air-to-air combat as the fighter versions of the F-15. The stats: anything up to 107 kills for zero losses. And – once more – it was the Israelis who led the way...

The first Baz models of F-15 came into Israeli service almost 50 years ago.



Following more than 40 years of service, the IAF's Baz fleet is responsible for more than half of the Eagle's overall kill tally. The first came on June 27, 1979, over Lebanon. Four F-15 Baz aircraft from 133 Squadron, known as 'The Knights of the Twin Tail' or 'Double Tail Squadron' were on patrol to defend an airstrike on PLO targets along the coast between Sidon and Damour. The squadron itself was set up in late 1976 to receive the new fighter (hence its name) and by 1978 it was at full strength and had already flown missions over Lebanon.

The four-ship on this day was led by Benny Zinker – the squadron's new commanding officer, with Major Moshe Melnik as his wingman (a highly experienced instructor pilot and five-kill F-4 ace), Eitan Ben-Eliyahu (future IDF/AF commander and former Double Tail CO, who was still flying with the unit)



Moshe Melnik, second from left.



Eitan Ben-Eliyahu.

was number three with Yoel Feldsho, the squadron deputy commander, as his number two in the sole F-15B.

Backing them up was a mixed force of more Eagle/Baz fighters and Israel's own indigenous Kfir, a Mirage-based delta multirole aircraft on CAP further back. This 'mixed Combat Air Patrol' was a shrewd use of resources by the Israelis. In previous wars tactics employed by the IAF included the more technologically superior fighter taking the lead in detecting targets and allowing other aircraft to take them down. It spread the experience of air-to-air fighting across the squadrons and was good for morale.

At around 11.10 hours the formation was informed by Israeli radar that three sections of MiG-21s had been detected, presumably reacting to the coastal raid. Radio jamming by the Israelis ensured that Syrian GCI (Ground Control Intercept) could not communicate with the MiGs. The F-15s then climbed from low-level, probably appearing on Syrian radar for the first time – but jamming ensured the MiGs again were not informed: they'd know soon enough...

Melnik takes up the story: "Benny opened up his afterburners, as did I, then we concentrated on our radar and got an immediate lock on the MiGs and we were quickly in launch parameters. They were around 20 miles or so away. Now we have permission from GCI to fire but usually we wait for the leader to give permission. I was wondering why Benny wasn't giving us the go ahead.

"I was waiting for him to tell me to shoot... It was then that I realised HE wants to be the first to make a kill. So, I don't wait and I push the pickle button at the same tenth of a second as he does! Both AIM-7F missiles ride off and launch together in what looked like formation! It was a marvellous sight, seeing the missiles go off together. Then we waited and nothing happened."

Despite good conditions, both missiles failed to lock. "We were amazed and



The Israeli Baz has been the dominant dogfighter in the Middle East for almost half a century!

shocked," says Melnik. "So, we went back to old habits – a good look outside, leaving the radar scope." The MiGs themselves had made a turn, before turning back towards the F-15s once more. Melnik: "They are making a reversal, turning right in front of us now from right to left. I get first tally on the MiGs (which makes him section leader now) and see they are MiG-21s so I select a Python 3 infra-red missile and launch it: I'm over-banked at more than 130 degrees. This time it scores a direct hit on the MiG-21 and there is no ejection."

With a second Syrian fighter looking to reverse onto Melnik's tail, thankfully he was being ably covered by Feldsho, who launched a radar-guided AIM-7F which destroyed the MiG-21 which was angling for Melnik.

Then a second formation of MiG-21s made itself known to the F-15 pilots, as well as the two remaining 21s. Eitan Ben-Eliyahu recalls: "The number four from the first formation came at me head-on and came past me, so it was one versus one. Once he passed by, he had no other choice but to engage me and I had no other choice but to kill him."

The secondary CAP had also caught up with the main Baz four-ship, realising it was not worth risking long-range BVR (beyond visual range) Sparrow shots with their countrymen out front. Yoram Peled was leading this formation of F-15s and IAI Kfirs and was closing quickly into the fight. Peled would see Ben-Eliyahu's descending dogfight from above and spot two MiG-21s ahead of Eitan Ben-Eliyahu's Baz. Peled would drop the nose of his F-15, acquire a tone from his AIM-9G heat-seeking missile and destroy the trailing MiG that Ben-Eliyahu was originally aiming for.

Ben-Eliyahu's MiG-21 was turning as hard as it could but could not match the F-15's sustained turn rate, thanks to a lack of excess thrust. Instead, the Syrian would trade height for energy, and down the spiral both Eagle and MiG would go. "So, after

two and a half turns close to each other, he was looking for the right time to escape," says Ben-Eliyahu. "He had no other choice as we were close to the ground and he had to decide. The minute he rolled out I did another pull on the control column, and I was right after him: around 600-650 yards. I switched to guns and squeezed the trigger twice: two shots and he was gone."

With the confusion of that dogfight back at base Ben-Eliyahu would ask: "Who smashed that MiG right in front of my face?" Peled would sheepishly admit that it was him and apologise, but all was forgiven as the IAF had not only taken four kills with their new F-15 Baz fighters, but done so with an AIM-7F, AIM-9G, Python 3 and 20mm cannon: all of the weaponry available to the Baz at the time, making this a gentlemen's set, if you will.

Melnik recalls: "Looking back now, my first flight in the F-15 was like my first solo in life... the excitement and joyfulness. It was just great. That day was a big achievement, but we all looked enviously at Ben-Eliyahu's kill as it was with guns and we felt he was the hero of the day as we Israeli pilots favour guns kills!"

This was just the start of the Baz's domination of the skies above the Middle East. Yet more Syrian aircraft were downed on September 24, 1979: four more MiG-21s. 1981 saw two MiG-25 Foxbats brought down – one on February 13 by Benny Zinker – and one on July 29, both with AIM-7s. This was the first time the Eagle had clashed with the aircraft it was effectively designed to destroy and the one that the Israelis had purchased the Eagle to protect themselves against.

On June 7, 1981, the McDonnell Douglas F-15 supported Operation Opera/Babylon, Israel's attack on the Iraqi Osirak nuclear reactor, which was made by General Dynamics F-16s, with top cover provided by Eagles. The first MiG-23 kills came during the Lebanon War of June 1982. Also known as Operation Mole Cricket (and ➤



Power and performance: an F-15 Baz reefs into a turn.



Israel has made much use of the two-seater Baz. This one sports victory markings as well as advanced 'R2-D2' comms equipment behind the canopy, just ahead of the extended airbrake.

locally as 'The Bekaa Valley Turkey Shoot') actions between 7th to the 24th of June saw 33 MiG kills for the Baz force (including an *Aérospatiale Gazelle* helicopter) using a variety of missiles and cannon fire.

The victory was so complete, even Melnik said: "As far as our squadron was concerned, it was more like a shooting range." The latest recorded kills for the Baz F-15 fleet came in November 1985, while other 'desert Eagles' scored kills, with the Royal Saudi Air Force F-15Cs apparently destroying two Iranian Air Force F-4E Phantom IIs on June 5, 1984.

Since the first deliveries of the F-15A Baz, the improved C/D models were delivered in 1982-1983, while surplus A/B models were delivered following Operation Desert Storm. Upgrades to the basic airframe and weapons (including air-to-ground, see the next chapter) meant that by the mid-late 1990s the IAF's Baz fleet was on a par with the USAF's F-15 MSIP (Multi-Stage Improvement Programme) airframes while the inclusion of the Elbit

helmet-mounted sight, meant that the IAF's Baz fleet had a close-in, look-point-shoot capability 10 years before the USAF's F-15 Eagles, when integration of the JHMCS (Joint Helmet Mounted Cueing System) and the agile AIM-9X Sidewinder came on stream.

Other 'Baz 2000' additions were to give the Baz airframes a fleet-wide cockpit update (with new multi-function displays) improved radars to fire the AIM-120 AMRAAM, upgraded data-link systems, GPS navigation systems and myriad Israeli-sourced electronic warfare equipment. It is thought that more than 8000 man-hours per airframe went into the update.

Today Israel's F-15 Baz fleet is as important as it ever was, with the upgraded Eagles still involved in air-to-ground missions, despite delivery of the more modern F-15I Ra'am. Also, even with the introduction of the 5th generation Lockheed Martin F-35 Adir, fighter-bomber, it is considered important to integrate both the Baz and the Adir together, so both are

ready to co-operate in any potential future air or ground battle.

With the Baz fleet enjoying almost 50 years in successful service of Israel, it would be interesting to see if – in four decades' time – the F-35 Adir (which means 'Mighty One') will be mighty enough to beat the F-15 Baz's total of 'around' 50 kills for no air-to-air losses.

The F-15C in Desert Storm

With Israel's predicament of being surrounded by enemies in the mid-1970s, it was understandable that they would be the first to blood the Eagle in air-to-air combat.

It would take the USAF's F-15 Eagle fleet some time before it made its first kill. Meanwhile, during the Cold War, the F-15's home-grown interceptor rival – the Grumman F-14 Tomcat – took part in two high-profile shootdowns of Libyan Sukhoi Su-22s in 1981 and MiG-23s in 1989. Adding to the Eagle drivers' frustrations would be rumours of the Tomcat's 160 kills during the Iran-Iraq war of 1980-1989, as well as the fact that the Iranians had an 11-kill double ace who flew the F-14 in the shape of Jalil Zandi. Hell, the F-14 was even the star of the blockbuster film *TOP GUN* while the Eagle was never given its own celluloid vehicle, but the F-15's turn would come and the USAF Eagle pilots would finally get their chance to score thanks to Iran's deadly enemy, Saddam Hussein's Iraq.

On August 2, 1990, Iraq invaded Kuwait, triggering Operation Desert Shield, which lasted until the following January when – on 17th of that month – combat was finally joined, with coalition air forces turning Desert Shield into Desert Storm... Finally, the F-15 Eagle community would have the chance to prove themselves in battle.

The first F-15 kill of the war would be against the agile MiG-29 and be made by Jon 'JB' Kelk as callsign PENNZOIL 63. In the first few hours of Desert Storm and at



The USAF's F-15 Eagle 'Top Gun' Cesar 'Rico' Rodriguez.



USAF Eagle aircrews had 'trained like they fought' for years before Desert Storm and it paid off in 1991.

night, he would take down his MiG in F-15C serial '85-119' using an AIM-7M Sparrow. Colonel Kelk would have a long association with the F-15, eventually finishing his flying career on March 12, 2009, when – after being the first pilot to accrue more than 4100 hours in the Eagle – he would 'suffer' the traditional dousing with a fire hose after his final flight with the Missouri Air National Guard, where he spent the final 17

years of his time with the Eagle. Five more Eagle kills would be made on January 17: two more MiG-29s and three French-built Mirage F1EQs, including a double kill for Robert 'Cheese' Graeter.

Two days later, on January 19, 1991, four F-15Cs were on patrol above Western Iraq and these Eagle drivers were about to take on a deadly foe: the MiG-25 Foxbat, flown by combat-proven Iraqi pilots.

Rick 'Kluso' Tollini was number one in F-15C '85-099', with Larry 'Cherry' Pitts as his number two, in '85-101'. Pitts recalls: "As it turned out, just as we were finishing our refuelling the AWACs called out bogeys around 60-80 miles north of us. I saw two groups of aircraft, the one in front as MiG-25s at 10,000ft heading south and another 30 degrees right at 15 miles as MiG-29s heading south, south-west. We were escorting a strike package and I figured the 29s were the greater threat, but they turned around and went (what we call) 'cold' so we were no longer a threat, so my radar work went back to the MiG-25s..."

As the range went down, Graeter locked on to one of the MiG-25s, but here was where the Iraqi pilots showed their mettle. At 25 miles and with Graeter 'locked-on', the MiG-25 pilots employed a Soviet anti-radar tactic: the Foxbat pilot started diving for the deck, to the west, while simultaneously dumping chaff to fool the Eagle's radar.

Pitts explains: "That was when we lost them for a while, but then they turn back in, hoping to see us first: that's when the second MiG gets my attention. I'm on the right side of the flight and he's passing across my nose at supersonic speed so I lock him up. Cheese says 'press', which means he's supporting me now and I'm flight lead, I go inverted and split S from 10,000ft to get down right behind the MiG. I pull around 12g on the airplane! I was concerned about the integrity of the plane but the Eagle is very strong and there ➤



'JB' Kelk took the first USAF Eagle kill of Desert Storm. He is pictured celebrating his final F-15 flight in 2009.



From certain angles the MiG-25 looked a lot like an F-15, thanks to twin engines and tails; or perhaps it was the F-15 that looked like the MiG-25...

was a lot of adrenalin flowing so it didn't even faze me. As I pulled down I can now 'tally-ho' the MiG-25, as I can see him on top of the cloud deck."

The only real way a MiG-25 in this situation could escape would be to light the afterburners and use the huge thrust available from the twin Turbansky R-15B-300 turbojets to try and extend away. The Foxbat has the power, but instead this MiG-25 pilot started to turn. This was a bad move. "He's a MiG-25 doing 700 knots, so his turn radius is the size of Texas," explains Pitts. "I'm in an F-15C Eagle at fighting speed in the mid-400s and my turn radius is 3200ft. I'm quickly inside his turn and in weapons parameters. He's turning hard and bleeding airspeed, but I'm inside him and 9000ft away and seeing the 'burner plume I choose a Sidewinder, get a good tone, I check the seeker is on him and the missile tracks true, but the MiG puts out flares and decoys the missile!"

What follows is almost a copy of numerous missile engagements from the Vietnam War. Pitts again: "I then select an AIM-7 and see the circle saying 'SHOOT SHOOT' in the HUD, and the missile is launched, gets to the target but fails to explode. So, I try a second AIM-9 and that's decoyed! This guy is fighting hard; I figured I may have to go and gun this guy, which isn't an easy thing to do as he's at 300ft doing 500 knots in a turn. Finally, I use my last AIM-7, fire it from 6000ft and it looks to go right up his tailpipe and he blows up." The pilot, Hussein Abdul Sattar, ejected but did not survive.

Pitts flew through the debris and saw Tollini high to his left. Then, around five miles off his nose Pitts saw a glint which he thought was the other MiG-25, closing fast. The bogey looked like an F-15 from certain angles, so Tollini called out: *'Is anyone in afterburner?'* as there was the tell-tale plume. When he heard there was no F-15 in afterburner, Tollini fired an AIM-9 and Pitts witnessed the action: "I see the missile

going towards the MiG, but it's decoyed by flares also. These guys are fighting hard... but then he turns belly up: we can see his planform and that's not good. Rick then fires an AIM-7 and that airplane turns into a ball of dust." Splash two MiG-25 Foxbats.

On the same day, just 100 miles away it was a case of F-15 vs MiG-29 once more and Cesar 'Rico' Rodriguez and Craig 'Mole' Underhill were there. 'Rico' said: "Our mission was defensive counter air protecting tankers, AWACS, Rivet Joint anyone in support of the offensive missions..." Suddenly the mission changed, 'Mole' recalls: "We were now asked to cover the strike package on the way out from a target."

Up ahead the pair had contacts and IFF suggested these were MiG-29s: it was an unnerving situation, as Mole explains: "The thing we heard was that Iraq had taken its

best Mirage F1 pilots and put them in the much more agile MiG-29s, so they were combat proven and in a good jet." Both F-15s quickly locked-up the MiG-29s which then turned east to avoid them, going 'cold' but just as this happened another pair of MiG-29s were coming in fast towards the F-15C pair from the west, on a heading of 330 just 13 miles away.

Rico says: "So, now we turn west to head off the threat. I'm a mile-and-a-half ahead of Mole and 1000ft below. Mole is now trying to get a lock and trying to get an ID before the merge..." Craig 'Mole' Underhill: "There are a lot of things you're doing with your left hand and you're dialling the gauges and doing things so you're not going to shoot down a friendly." At eight miles AWACS called them as hostile. Mole again: "Literally, as soon as I hear that I'm firing an AIM-7. It comes off the rail like a freight train under my nose then starts to pull lead on that first aircraft."

Then things started to really happen: with the two F-15s and two MiG-29s charging straight at each other and with an AIM-7 Sparrow in the air, the second MiG-29 piloted by Captain Jameel Sayhood locked up 'Rico' Rodriguez who then had to take evasive action. He says: "I'm fully defensive and need to get below his plane of motion, which is 8000 feet, so his radar is looking at me and ground clutter. I pump out chaff also at the same time as I'm doing so."

The move means that Mole's Sparrow goes by Rico's F-15... and close. Mole: "I'm watching my missile go in towards Rico: plus or minus 200-300ft over the top of his jet. That was eye opening..." For Rico it was more so: "I hear Mole call 'fox' and I see left, over my shoulder, the motor of his AIM-7 pass me by. I'm at the mercy of what that missile is going to do, but two to three seconds later... BOOM." Splash one MiG-29.



The MiG-25 was a much-vaunted threat to the Allies in Desert Storm, but so was the MiG-29: an agile match for the 'teen series' of US fighters. This one wasn't as lucky as those that fled the air strikes.



Much use was made of air-to-air refuelling in Desert Storm.

The other MiG-29 – piloted by Sayhood – decided to bug out. Meanwhile Rodriguez rejoined with Underhill. Rico says: “So, I climb up and rejoin Mole for mutual support and at this time I’m thinking we should just get the hell out of there.”

As the pair were heading south for the tanker there came another warning from AWACS: there was a second contact 10 miles north. Turning back into the fight, the Eagle pair picked him up with radar: ‘Mole’ Underhill was at 8000ft, the bogey was at 10,000ft and Rico was half a mile behind Mole. Mole says: “I lock him up with auto guns and he breaks back left in a hard G turn: this makes him a large radar reflective target for a Sparrow. So I try and lock him up and put my nose on him and shoot an AIM-7, but the reticule goes to a diamond which says he’s a friendly. Now I’m wondering about my first shot and that’s a terrible feeling. Did I previously kill a friendly? We in the Eagle community take fratricide very seriously.”

Mole then had the bogey locked up with his F-15C’s AN/APG-63/70 radar, even if IFF (Identification Friend or Foe) would not let him fire his radar-guided Sparrow. As both aircraft went into the merge and what could become a turning fight, Mole was ready to switch from AIM-7 to AIM-9 Sidewinder and then to guns, if need be. “He’s breaking hard into me,” recalls Mole, who then climbed to 9000ft above Rico, leaving his wingman to head into the merge and ID the bogey while Mole was ready to take a missile shot, should the unidentified

aircraft prove to be hostile.

Rico says: “I’m looking at my target direction box to see if I can ID him before visual range so Mole can take a shot and get this over with. I’m going head-on with him. I was committed to the merge to get as close as possible for a visual ID. As he came past me, I could see the Iraqi colours on the tail fin and the MiG-29 silhouette just as we both start a left-hand turn.”

The fight between Rico and Sayhood descended to the desert floor – around 600ft – which meant it became a big factor in the battle itself. Rico tried to position himself for an AIM-9 Sidewinder shot, but then Sayhood tried to execute a Split-S move (a half roll, followed by an inverted half-loop, to lose height and change his direction of travel by 180 degrees).

The Iraqi pilot had insufficient altitude to complete the move and crashed to the desert floor. Splash two. Rico would be awarded a manoeuvring kill but would be frustrated on the way back to base when he was continuously being ‘locked up’ by the AN/APG-63 of an RSAF F-15C, forcing him to threaten to destroy the offending aircraft if it happened again.

Rico’s second and third kills

January 26, 1991, saw a textbook example of BVR kills for the F-15 and Rico was involved once more. This time he was with Rhory ‘Hoser’ Draeger, Tony ‘Kimo’ Schiavi and Bruce ‘Roto’ Till and this four-ship was over Western Iraq once more, on CAP rotation, looking for trade over the H-2 Iraqi

airfield, which was more than 200 miles west of Baghdad.

Schiavi recalls: “We hear that there are four guys taking off from H-2 and heading to the north-east. So we go to work: everyone has responsibilities now in the flight. Some guys are looking low, some looking high: we’re covering anything from ground level to 50,000ft.” The four moved into line abreast formation, to give their radar maximum coverage ahead and pretty soon four contacts were seen. These clearly weren’t friendlies and the contacts were made at long range. They had to be MiGs.

The four F-15Cs went to full military power to chase down their prey; Draeger says: “We keep radars in sweep to know how many of them there are, but we don’t want a lock-on yet. If we do that too soon, we would alert them. Suddenly we see one MiG return back to H-2 – so there are only three of them, in a V formation. Soon they’re confirmed as MiG-23s.”

The Eagles were now cleared ‘hot’ to shoot. Draeger explains: “Our rules of engagement mean we can take action and we do. I assign targets, I have the lead, Kimo the lead’s trailer and Rico has the southernmost guy. We’re locked up and fire AIM-7 Sparrows.” Soon, three huge explosions lit up the sky with the F-15s coming through the clouds to see missiles hit the targets: this had been a textbook BVR mission and Special Forces later recovered the cockpit camera of one of the MiGs which had even recorded the moment of impact. ➤

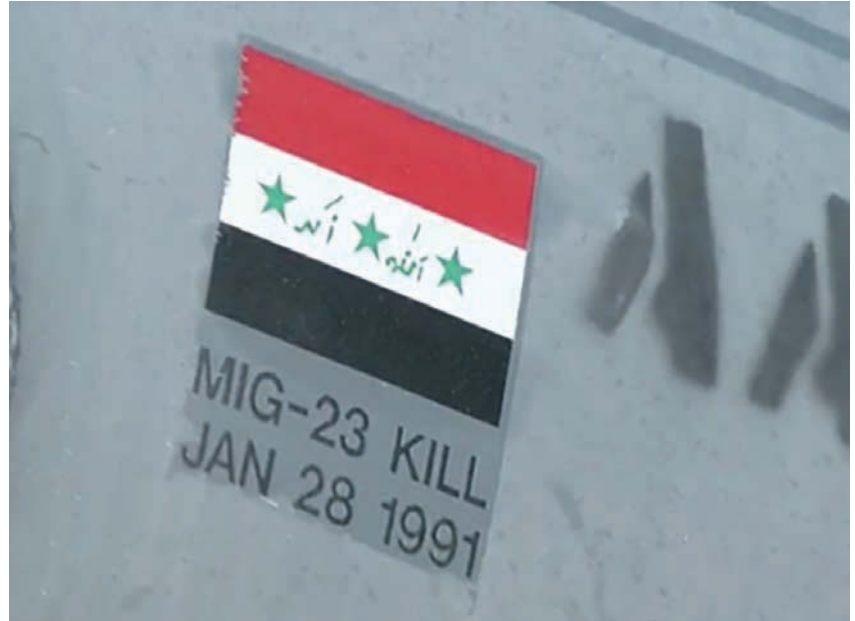


The Eagle was 'king of the hill' in air-to-air engagements during Desert Storm.

Rodriguez would later bag his third kill during Operation Allied Force in the Balkans. On the night of March 24, 1999, a MiG-29 flown by Major Iljo Arizanov was destroyed by a Raytheon AMRAAM fired from Rico's F-15C. This would put him level with two other USAF pilots on three kills – the highest for a US pilot since the Vietnam War.

Air-superiority assured

Much has been made since the Gulf War about the complete saturation of the Iraqi



A kill marking showing Rick 'Kluso' Tollini's January 28 kill.

air defences and the sheer number of Eagle kills versus those of other coalition aircraft. The lessons of air-superiority had been well learned.

The orchestration of pinpoint attacks on command and control bunkers, airfields and the like would eventually paralyse the Iraqis, making them incapable of making their own co-ordinated air strikes or even putting up much more than a token defence. By the end of January more than 100 Iraqi Air Force front-line aircraft would

flee to Iran in a desperate bid to save the bulk of their modern fighter-bomber force.

What defence they did mount led to the destruction of 36 enemy aircraft by the F-15C community. Of the grand total itself, one kill was also awarded to an F-15E (a Hughes 500 Defender helicopter, destroyed with a GBU-10) an MBB Bo 105 chopper was destroyed by cannon fire from an A-10A Warthog, another A-10A would do the same to a Mil-8 Hip, two Chengdu J-7/F-7 Airguard/Fishbed derivatives were



Lessons from Desert Storm would be used to train future F-15 crews while more modern weapons like the AIM-9X and AMRAAM would bring even more lethality to the Eagle.



Even today, an F-15C cockpit is a prized place for a pilot.

taken down by McDonnell Douglas F/A-18 Hornets, while even the EF-111A 'Spark Vark' was credited with a manoeuvre kill on the first night of the air war.

And what of the F-14 Tomcat? One pitiful kill... where an F-14A from VF-1 squadron took down a Mil-8 Hip with an AIM-9 Sidewinder. Almost embarrassing in comparison: so what gives?

The biggest reason seems to be that the lion's share of chances to take down enemy aircraft would obviously go to the air assets

used for the major CAP areas, or TARCAP/escort duties. Naturally this would be the domain of the Eagle.

Other factors often mooted included the fact that AWACS would tend to look after their own when it came to trade and that US Navy fighters would generally escort their own strike packages which were in turn covered by generous USAF CAPs. Another suggested reason was that – with their experience with the F-14 Tomcat and AN/AWG-9 in their war

against Iran – the Iraqis generally avoided the big Navy fighter.

Perhaps the truth is more prosaic and simply down to the USAF buttressing the air defences with the capable Eagle. Even the likes of other coalition Eagle users, the Royal Saudi Air Force, weren't placed at the very forefront of the action.

In fact – despite two kills by the same pilot on the same day – Ayhed Saleh al-Shamrani – history seems to be at the very least, somewhat disingenuous as to what happened on January 24, 1991.

With both kills being made by AIM-9P Sidewinders (don't forget both the F-15 Eagles and weapons delivered to the RSAF were a little behind the specification of those used by the USAF in 1991, hence they may not have had, let alone used AIM-9L/M all-aspect versions) questions were asked as to why the pilot was (allegedly) shepherded into position by AWACS right up to visual range where he could take down both of the Mirage F1EQs, where his wingman was (if he had one) and why he hadn't tried to go for a BVR kill with AIM-7 Sparrows.

Maybe it was politics, for – even as backstop CAP – it was worth the coalition's time to get other air forces into the action (especially an Arab one). And when you consider that Ayhed Saleh al-Shamrani destroyed two aircraft that were supposedly intent on destroying a Saudi Arabian oil refinery, the job was eventually well done, whatever the support. ➤



For years, Japanese-based F-15s have been ready to answer any call in the Pacific Theatre. Today it's the job of the F-15EX Eagle II which will be based at Kadena.

Eagle undefeated: fact or fiction?

You're building and selling the greatest air-superiority fighter the world has ever seen, so it stands to reason you want to make it look good.

Call it PR spin or whatever, the figures seem to bear out the fact that the Boeing F-15 Eagle is the greatest air-to-air fighter ever built, with a kill ratio of 104:0. Yes, that's 104 kills for zero losses and that total could be as high as 109 kills.

At the time of writing no kills have been confirmed by either USAF or Israeli Air Force Eagles in the war over Iran (Operation Epic Fury) but two advanced Eagles from the Qatar Emiri Air Force (QEAF) shot down two Iranian Su-24 Fencer tactical strike aircraft that were closing in on the Al Udeid Air Base. This is the Qatari base heavily used by US forces which also contains a liquified natural gas processing facility. The sources quoted by the report on CNN said the Iranian bombers were 'two minutes' away from their targets and were flying at just 80 feet to avoid detection...

These two kills are the first for the 'advanced' Eagle family so can be added to the Eagle's already impressive overall score...

But have any F-15 Eagles been lost in air-to-air combat? Rumours are that some have been...

It seems most claims cannot be backed up and – considering the PR it would generate – if one *has* been shot down, we would have proof, surely. Why? Consider the shoot-down of Lieutenant-Colonel Dale Zelko's Lockheed F-117A Nighthawk on March 27, 1999. The 250th Air Defence Missile Brigade of Yugoslavia, commanded by Colonel Zoltán Dani managed to do



If a Lockheed F-117 Nighthawk can be taken down, why has an Eagle not been bested in air combat?

what many thought was impossible: shoot down a stealth fighter bomber. When they achieved the feat, the press generated from the resultant display of the wreckage was considerable. If there were any remains of an F-15 Eagle to be found as a result of an air-to-air engagement, surely we'd have seen it?

During Epic Fury the Iranians would often spread misinformation about the downing of F-35 'fifth generation' fighters... Such is the undoubted PR coup for doing so.

The first such claim against an F-15 unsurprisingly comes from the theatre of conflict where the Eagle itself claimed its first kill: the Middle East. It was claimed during 1978 that an Iraqi MiG-23 – possibly an MS or 'Flogger E' otherwise similar to the base B version – took down an Eagle. It was thought that a Flogger from 39 Squadron shot down an IAF F-15 in Iraqi airspace, but despite the claim

being made many times over the intervening decade – no evidence or wreckage was produced.

In 1981 another alleged Eagle take-down was made in a like-for-like series of ambushes. The Eagle was a 'big-deal' purchase for the Israelis thanks to the MiG-25R overflights made from 1971 on: the IAF's F-4E Phantoms couldn't touch the fast and high-flying recce jets. A decade later and by now the IAF had the tool to take down the Foxbat. In February 1981, the story goes that a pair of Israeli F-15 Eagles ambushed a pair of Syrian-flown MiG-25s and shot one down. A few months later, it's alleged that the Syrians repaid the favour. In June 1981 they and Soviet sources claimed that MiG-25Ps of the SAF set up their own ambush, shooting down an IAF Eagle from beyond visual range with ripple-fired semi-active radar-homing medium range missiles.

Once more, no evidence was produced at the time and when you consider that the US Navy in the same year provided voice recordings of the Libyan Sukhoi Su-22 shoot-downs that took place on August 19, as well as hosted a press conference with the pilots involved, you wonder why the Syrians/Soviets didn't do the same, rather than simply repeat the claim and yet offer nothing in the way of evidence. Also, the Syrians apparently weren't even flying MiG-25Ps at the time...

But the plot does thicken: the Foxbat the Israelis shot down in February 1981 was a MiG-25R reconnaissance machine, flying over Lebanon as a single, while the Syrians claimed that the MiG-25P was a single when it shot down the Eagle in response. The Syrians' version was that a MiG-25PD (equipped



Qatari F-15QAs took out two Fencers on March 2, 2026.

with an infra-red search-and-track system, as well as chaff/flare dispensers and powerful Smerch A2 radar, and some electronic countermeasures equipment) played the part of a high-flying reconnaissance MiG-25 heading towards Beirut. Suddenly, two four-ships of IAF Eagles came up to intercept. The story then goes that the single MiG-25PD locked up his Smerch A2 radar and ripple-fired two AA-6 Acrid/R-40 long-range missiles – possibly following Soviet protocol and launching the semi-active radar-guided version (R-40RD) after an infra-red version (R-40TD).

Allegedly, the range was something like 35 miles, which was way above that of the AIM-7F Sparrows which equipped the F-15s, but within the advertised range of the R-40 (31-50 miles). This begs the question as to what order the Acrids were fired in. Normally, Soviet engagements would see the IR missile go first, so it didn't just follow the heat source from the SARH missile. Again – according to Syrian sources – the IAF F-15 crashed into the sea, north off the coast of Tyre/Lebanon. The Israeli pilot apparently ejected from his stricken Eagle. In the same combat, the IAF claimed to have shot down a MiG-25 Foxbat with an AIM-7.

A year later – in July 1982 – eight SAF MiG-21s took on a mixed formation of F-15s and IAI Kfir over Beirut. The Syrians admitted to losing four of their own number, but they did claim an F-15 Eagle too... Again, despite alleged eyewitness accounts no evidence was given or wreckage found to confirm the kill.

Fast-forward nine years to Desert Storm and it was the first chance for USAF F-15 Eagle fighters to take on the likes of the Iraqi Air Force's MiG-29s and MiG-25s... But first (once more) the Israelis were involved in another 'alleged' encounter. The Iraqi Air Force claimed that on the eve of Desert Storm – on January 4, 1991 – a number of IAF aircraft intercepted a formation of Israeli Air Force F-15 Baz fighters and shot one down near their H-3 Air Base, in western Iraq. A former retired high-ranking Iraqi officer claimed that the kill was valid and that the aircraft crashed with such force that only a few recognisable parts were found at the crash site. These were sent to Baghdad for investigation and apparently taken by US forces during Operation Iraqi Freedom in 2003.

The next alleged claim was on January 30, 1991, when two Iraqi Air Force MiG-25PDs were sent aloft to intercept what seemed to be a pair of USAF F-15Cs, which were on Combat

Air Patrol between the Iraqi capital and the Iranian border, in a bid to stop Iraqi Air Force machines flying to Iran. It's thought that – initially – Iraqi GCI (Ground Controlled Intercept) sent the MiGs after a spurious radar return, against which one of the MiG-25s launched an R-40, but did not appear to hit a target.

The same pair of MiG-25s was then vectored to another 'pair' of USAF F-15Cs and an R-40RD was fired from between 10-15 miles away. At around the same time one of the F-15Cs ripple-fired two AIM-7M Sparrows, which missed their intended target as the MiGs made a fast, left hand turn and headed north. In the meantime, the Iraqis say they saw an F-15C going down and felt that the R-40 had done enough damage to make the aircraft a confirmed 'kill'.

The remaining Eagle is reported by the Iraqis as having fired no fewer than three more Sparrows, which failed, leaving the sole-surviving F-15C to bug-out to the south, to avoid the two Foxbats. The Iraqis then claimed that the MiG-25s left the area and headed at high-speed back to base, where they were nearly caught unawares by another pair of F-15Cs. The Iraqis say that three AIM-7Ms were fired at the two MiGs, with one impacting on the runway to the rear of one of the Foxbats as it ended its landing run.

Subsequently, the Iraqis who were tracking the targets, claim that one of the pair of F-15s from the earlier engagement was seen to slow down and disappear off radar somewhere in Saudi Arabia, leading to a probable kill, which was upgraded to a full kill when (allegedly) the wreckage of the aircraft was seen by a smuggler in northern Saudi Arabia.

From US sources, no fighter 'albino' F-15C was shot down during any of Desert Storm or the run-up to that campaign. The USAF did lose two F-15E Strike Eagles: one on the night of January 17, 1991, and another two days later – but these were claimed to have been destroyed by Iraqi ground-to-air defence units.

So, what's the closest we've seen to an F-15 destroyed in combat? Sadly, the MiG-25/R-40 combination did destroy a McDonnell Douglas F/A-18C in the early hours of January 17, flown by Michael Scott 'Spike' Speicher – although initially US Forces claimed it was a ground-to-air missile that destroyed his Hornet and not an R-40D fired by Captain Zuhair Dawoud of the 84th Squadron of the Iraqi Air Force. Speicher was killed in the engagement, although it took many years before his remains were repatriated back to the US.

During what later became known as the Bekaa Valley Turkey Shoot, around 100 Israeli jets took on the same number of Syrian aircraft in one of the largest jet

fighter-to-fighter battles ever fought. During this battle on June 9, 1982, a Syrian MiG-21 hit an F-15D Baz with an AA-8 Aphid (R-60) short-range infra-red dogfight missile. The Eagle was badly hit, but it managed to limp back to base and was repaired.

Bizarrely there has been an F-15 defection. During Desert Shield – the build-up to Desert Storm – one Royal Saudi Air Force pilot defected to Sudan (then a country with ties to Iraq) with his F-15C. In early November 1990, the pilot – who was said to be unhappy at the prospect of fighting fellow Arabs – took off on a training mission only to set course for Sudan.

In the immediate aftermath it was rumoured that the US military in the Middle East were warning of a rogue F-15C that could be used in the area, but instead it was reported that the pilot was granted political asylum and the aircraft was returned to Saudi Arabia within hours, if not days. It was also rumoured that the Saudis may have made a considerable multi-million dollar 'donation' to the Sudanese government to aid in the Eagle's swift return.

Epic Fury 'kills'

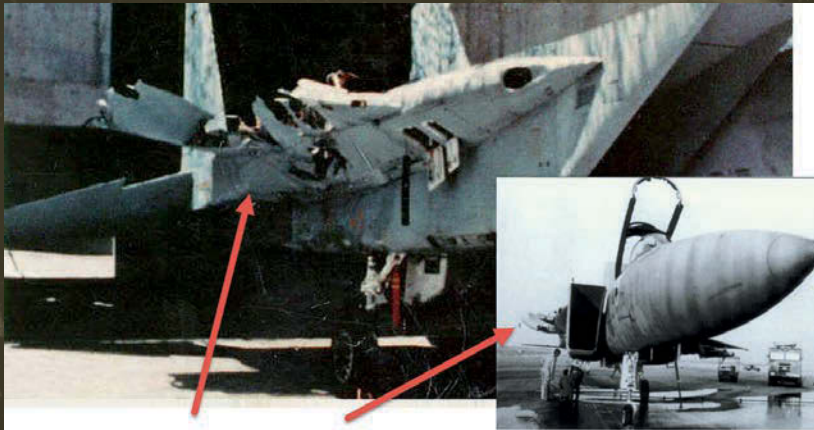
One bizarre – and as we went to press still relatively unexplained – loss of three F-15E Strike Eagles on March 1 in 'Epic Fury' raised more questions than it has so far answered.

Initial reports suggested that Kuwait's Patriot surface-to-air defence battery had taken down the three F-15E Strike Eagles in quick succession. However, military aviation experts soon surmised that the fact video evidence showed that the tail-end of one of the aircraft was hit (and the subsequent safe recovery of the six crew members) so that it probably wasn't a Patriot's heavy 90 kilo (200lb) warhead, but perhaps – more likely – a heat-seeking missile like the Sidewinder with a smaller 10 kilo warhead.

Later videos showed what seemed to be a Kuwaiti F/A-18 Hornet engaging the F-15s and shooting them down. Initial feelings were that this was a classic 'blue-on-blue/friendly fire' incident. However, again some experienced aircrew were asking how – at the sort of ranges used in AIM-9X parameters and those shown on the videos – such mistakes could be made, even with some 'foul-up' in IFF (Identification Friend of Foe) equipment.

At the time of writing no final report on this incident has been made. ➤

One wing on my Eagle



The damage done to the F-15 Baz was considerable.

and his navigator Yehoar Gal. Initially they didn't realise the extent of the damage to the Baz, oblivious to the fact that most of the aircraft's right wing had been sheared off in the collision. Literally only a two-foot stump was left of the starboard wing, protruding from the wing root/fuselage itself.

Nedivi recalled: "We were on a simulated airfield defence mission when it happened. I saw the number three man and he was upside down, while I was at 13,000-14,000ft. I fired a simulated missile and then we were 'stomach-to-wing' so we couldn't see each other. That's when we collided and the A-4 fireballed immediately. I then found myself nose-down at about 30 degrees and the aircraft was spinning. I told Yehoar to 'prepare to eject' but when I lit the afterburners (not the normal thing you do in a spin) the spin stopped and the nose came up. I asked my wingman to inspect my plane, but the spray of fuel from the wing hid what was (or not) there."



This close-up shows just how much wing was missing!



Ziv Nedivi and back-seater Yehoar Gal.

After another spin after power was reduced, Nedivi found that control of the F-15D could be held but only with the application of lots of power. With Nedivi and Gal some 10 miles out from Ramon Air Base, the plan was to come in fast and make as safe a landing as they could. With the pair unaware that they were – in effect – flying on one wing, they made their approach at much faster speeds than normal. Nedivi explained: "A normal approach is around 130 knots, but we made ours at around 250-260 knots, about twice that of a normal landing. As a result of this I put down the F-15's emergency arrestor hook which engaged the cable around a third of the way down the runway. We hit that, but the speed we were going meant that the hook itself tore off the aircraft and we eventually stopped 20ft short of the barrier at the other end of the runway."

The sight that awaited them was shocking. "I remember the last 50 knots on the runway and our wingman said 'you'll not believe what you flew in on'. When we came to a stop, I shook the hand of Yehoar and looked back to see no wing on my right-hand side. If I had seen that, I would have ejected..."

It seems that the wide body of the F-15 itself provided a degree of lift which was then aided by the excess of power from the still-working F100 turbofans and the remaining intact control surfaces. Combined, this was just enough to keep the Baz in the sky. When McDonnell Douglas officials saw pictures of the damage, they were sure that it was from a taxiing crash on the ground and didn't think it was possible for the aircraft to be flown in that configuration.

The aircraft itself – 957 – had already claimed four kills during 1982 and would go on to share another kill – a MiG-23 at the end of 1985. The IAF had been able to repair the damage and the aircraft lived to fight another day.

Nedivi is in no doubt as to what saved him and Gal that day: "I'm not sure any other aircraft could have handled that damage and brought us home safely. The final testament is that an F-16 pilot friend who – after seeing the damage – said 'can I transfer to F-15s?'"

Eagle versus Raptor



Old versus not quite so old: the Eagle waits while the Raptor lifts off...

Mike 'Dozer' Shower graduated top of his class and got the pick of the various seats available to a USAF pilot – including slots as an F-111 pilot and a variety of places as an F-15C fighter pilot. He recalls: "So, I picked the F-15C slot at Elmendorf, Alaska and went from Tyndall in Florida up to Elmendorf, but my first F-15 flight was out of Tyndall in a two-seater and my second flight was one of those max performance take-offs. So many things are happening at once: it was summertime in Florida, hot and humid trying to catch up with the airplane as an F-15 in military dry power is like a T-38 in full afterburner! It takes time to work it out: eventually your mind catches up. It was like Star Wars when they hit light speed.

Dozer was in the F-15C community right at its peak during the 1990s through to the 2000s. He says: "Back then the F-15 was the best plane out there: it reigned supreme. It flew high (until the F-22 came along) had a big radar, but it was the weapons and training and sensors that made it." Mike would get a MiG-29 kill during Operation Allied Force over Bosnia on March 24, 1999, ripple-firing an AIM-120 and an AIM-7 Sparrow.

So, let's talk F-15C versus F-22A Raptor: Dozer?

"In an F-15 you're sensor operator, you're working the radar: you're the guy working this all out and managing the systems and putting together the 3D picture in your head. That's the difference with the F-22 Raptor. It does it all for you... you could take four weapons instructors in an F-15 each and you could have some lieutenant who is 'weapons clueless' and he's gonna find them all and kill them all. Then you put one really good guy in an F-15 against a Raptor and he's still gonna get killed, there's that much of a difference in technology. It's about sensors and training."

In 2001 there was a request for experienced pilots, F-15C pilots and ex weapons school and that meant that Dozer was going to get lucky and get to test the F-22 Raptor. He says: "By 2002 the Raptor was a bit behind time – the airframe and stuff was good, just not the electronics. I kinda termed the phrase 'offensive stealth and defensive stealth' as the F-22 can be offensive but the likes of the B-2 Spirit and F-117A Nighthawk have to run and hide, right? The F-22 is a different use: it flies fast and high, the F-117 is low and slow, while the B-2 is high and slow."

Initially – at Edwards Air Force Base – as is usual with a new platform, getting things to 'work' was an issue. Dozer says: "I was at Edwards for about a year and a half and we had a hard time to get two planes to work at same time. First day we had two planes to work, we had Langley F-15s next door and we are like: 'Hey, we've got two planes working, wanna come fly against us?'"

So we hop in the jets and set up the two of us, we've done simulator stuff but we're not sure it will work. We take off in the F-22s, we've got tankers, we've got the F-15s and we try our tactics out. We set up the battles against different numbers of F-15s, up to eight against two Raptors and they just never saw us. We could hear them saying: 'Hey, where are you at?' and we are a mile behind them... These were combat experienced pilots we're talking about. It was really cool. This proved what the F-22 could do. I had one guy who had worked on the F-22 programme come up to us almost crying saying: 'Hey you validated my whole life's work.'

"We tested against F-15s, F-16s and then people realised it wasn't a joke or a theory: the F-22 worked. My favourite time was a Raptor four-ship versus 12 F-15Cs and we're like: 'let's see how quick we can kill these guys...' So we hook up way up high and supersonic and they can't take a shot and they're running away at Mach 1 and we kill them in two minutes or so. I was thinking *'this thing is unbelievable.'* When the sensors work and each plane talks to each other, the Raptor is nearly untouchable when things are right. The F-22 versus a 4th generation fighter is like having two football teams against each other and one of them (the F-22) is invisible!"

Extracts courtesy of Aircrew Interview; check out: www.aircrewinterview.tv or www.facebook.com/aircrewinterview ■



Mike 'Dozer' Shower knows both the Eagle and Raptor's capabilities.

The Strike Eagle variant has seen service since 1991's Desert Storm with the USAF.



Air-to-Ground in the Eagle

The Strike Eagle was fresh into service when it got the call to drop its first bombs in anger. Since then, it's matured into perhaps the finest multirole fighter-bomber the world has ever seen. Meanwhile Israel has taken both pure fighter and attack Eagles into battle in the Middle East.



It was August 1990 and the 336th Tactical Fighter Squadron, known as 'The Rocketeers' had been flying their butts off.

The F-15E Strike Eagle was – at this time – a brand-new aircraft and one which had some old hands on the sticks as well as some new guys and they'd all been flying long hours and many sorties in a bid to get as proficient with their new fighting plane as possible. As part of the 4th Tactical Fighter Squadron at Seymour Johnson Air Force Base in North Carolina, the 336th was the first operational unit to receive the latest, multirole version of the F-15E. They'd said goodbye to their trusty F-4E Phantom IIs and that hurt, literally. As Captain James 'Chainsaw' McCullough so eloquently put it: "I have a two-hour butt – that means I can take about two hours on the hard, unforgiving seat of the Strike Eagle without getting sore."

So, in the summer of 1990, the F-15E Strike Eagle might have only been in service for a matter of around 18 months, been judged 'operational' for less than a year and ushered in a new era of accuracy and self-defence for the former F-4E and F-111 crews that climbed into that cockpit, but – well – it seems like the seat wasn't quite as comfy as that in the older aircraft.

And this was an issue for 'Chainsaw' and his squadron mates as they were looking forward to a 13-hour transit flight to Saudi Arabia to be part of 'Desert Shield'. With Saddam Hussein's invasion of Kuwait ➤



The then-new F-15E Strike Eagle was an important component of the Desert Shield build-up in 1990 and the Desert Storm offensive in 1991.



This 1995 shot shows Strike Eagles along with the mighty F-14 Tomcat, A-6 Intruder, EA-6B Prowler and Lockheed Viking which are long since retired. Legacy Hornets are today only used by the Marines.



Whether in the desert or in Europe, low-level missions were par for the course for the F-15 Strike Eagle crews. The ride may not have been as smooth as on the F-111, but the ability to defend themselves was much greater...



A classic shot from Desert Storm, with two Strike Eagles lining up with an 'Albino' F-15C and a brace of Fighting Falcons.



The conditions were difficult for any allied aircraft during Desert Storm and the ground crew most of all!



Air-to-air refuelling has been a must to extend strike missions. And in the latter stages of Desert Storm, the move was made to medium altitude.

in early August 1990, many allied fighter and strike-fighter squadrons would find themselves part of the largest aerial armada put together since the Second World War: first as part of a protective force, to ensure Iraq did not strike out south and west and later as a strike force which would aim to destroy Iraq's ability to wage war, pushing the occupying forces out of Kuwait.

Chainsaw would eventually go to K-Mart and buy a 'rubber doughnut' cushion for the flight which took him and his squadron from Seymour Johnson to Thumrait, in Oman, before they moved to Al Kharj in Saudi Arabia. This cushion would last until he popped it while flying high-G manoeuvres in combat, but other upgrades would be coming that would make the F-15E more effective.

The 336th would be joined by the 335th squadron in-theatre and begin training for the action ahead. Many problems had to be ironed out during the build-up to Desert Storm: the F-15Es were new and so were some of the crews. While many were former F-4E fighter/attack guys, some came from the low-level strike F-111 and even close air support A-10 communities so therefore didn't have quite the same handle on the air-to-air side of the mission as some. This was important as the Strike Eagle was expected to fight its way into and out of a target area.

With the expectation that any aircraft had to fly low to survive, training often went down to as low as 50-100ft – sometimes against direct orders from squadron commanders who didn't want to lose

valuable men and machines. This and the need to make training as 'real' as possible led to some casualties across the various units and included a 336th F-15E crew on September 30: Major Pete Hook and Captain Jim Poulet who crashed in a training exercise.

Other issues came from the 'newness' of the E-model. Some ordnance wasn't yet cleared for the Strike Eagle, such as the Mk.20 Rockeyes that were considered vital to the anti-tank mission, so – often – localised ingenuity by the men and women on the squadrons would simply make things happen themselves. Overall, it was an amazing feat to get these new airplanes and their pilots 'combat ready' and said a lot for the professionalism of everyone involved.

The action began when Operation Desert Storm started on January 17, 1991, when a force of 24 F-15Es attacked SCUD launcher sites in Western Iraq. Some of the Strike Eagles in that first effort were so loaded down with 12 Mk.20 Rockeyes, two fuel tanks and two AIM-9s that, according to Captain Bill 'Moon' Mullins in William L. Smallwood's excellent book, *Strike Eagle: Flying the F-15E in the Gulf War*: "...we were completely loaded and we had to lose two of our four Sidewinders to get down to our max gross weight of 81,000lb. When we taxied I was surprised to hear a THUMP, THUMP, THUMP underneath us and that was a result of the aircraft having sat with all that weight on it for 48 hours: it had moulded a flat-spot on the landing gear's tyres..." Further F-15E strikes were launched that night and one F-15E had a chance of bagging a MiG-29, but the AIM-9M missile that was fired failed to guide.

The Strike Eagle cadre's first combat loss came on January 18, when a petroleum plant was hit near Basrah. This was a target heavily defended by triple-A, SA-3s, SA-8s and French-built Roland systems. In this attack a pilot and his Weapons Systems Officer were killed. Two nights later another F-15E crew were hit by an SA-2 – but ejected safely and evaded capture for two days, until picked up by the Iraqis. Many aircrew in-theatre didn't think much of the supposed search and rescue provisions. Hence many F-15E crew would dump the standard issue 0.38 calibre revolver (with six bullets) and – before coming to the Gulf – would go to gun stores and purchase rapid-fire pistols with 15-shot clips and buy a second, loaded clip, just in case.

February 14 would see the Strike Eagle's most bizarre 'kill': a Mil-24 Hind gunship which was around 900ft in the air. F-15Es were requested by special forces as a number of Iraqi gunships were spotted in the vicinity. The lead Strike Eagle from the 335th squadron acquired one of the choppers via its FLIR system and dropped a GBU-10 which went in right through the rotor disc.

On February 21, Strike Eagles from the 336th would show their prowess by destroying around 20 Iraqi Air Force ➤



When this was taken in January 2012; Strike Eagle No. 89-0487 sits at Bagram airfield, Afghanistan. At the time, this aircraft was the only F-15E to bag an air-to-air kill from Desert Storm and would be the first to log 10,000 hours of flying time.



This 1996 shot shows Strike Eagles that had to fly their nest to get away from Hurricane Fran.

*Communication and cohesion is the key
to a good Strike Eagle crew.*





Hot-pit refuelling of a Mud Hen in 2001.



This Lakenheath-based Strike Eagle had to take an arrestor cable for a safe landing in 2004.

jets on the ground at Tallil Air Base using cluster bombs and guided munitions. The mission itself came about when then-Colonel David 'Bull' Baker (a former Vietnam War POW and later brigadier-general) was conversing with his twin-brother Steve who was serving with the US Navy and just happened to tell him of a picture taken by a recce-pod equipped F-14 Tomcat, of aircraft parked up, nose to tail near the air base itself. With this being such a tempting target, plans were drawn up to attack the area – but care had to be taken as the targets were around 250 yards from an important local shrine: the Strike Eagles would have to be precise.

Four F-15Es 'visited' the target and Bull Baker and his WSO Captain Mark 'Bones' Wetzel would play their part in the destruction. Baker – who sadly died in 2009 – would later report: "We were eventually lasing a bomb on an aircraft with each pass. We'd hear: 'We got a Fishbed! We got a Flogger! We got a Frogfoot! We got an F1! What we were all doing was pretty impressive. We got a direct hit on a Mirage F1 and this thing comes shooting out of the fireball – it was the ejection seat. We hung about for 40 minutes and took out 18 airplanes. We denied them a whole squadron of fighter aircraft. It was a good night's work." The destruction was valued at around \$200 million worth of frontline aircraft!

During Desert Storm, the F-15E and other allied aircraft would move from low- to mid-level attacks: the destruction on Tallil was made at between 20,000-22,000ft. As one F-15E crewman, Captain Chris Hill, said: "King Kong with a noose around my nuts could not drag me down to low altitude again."

Beyond Desert Storm

F-15Es remained in Iraq after the ceasefire and the Iraqis' withdrawal from Kuwait.

Strike Eagles would take part in Operations Southern and Northern Watch, working from bases in Turkey. In December 1998, F-15Es took part in Operation Desert Fox, once more seeing action and supporting operations in Operation Provide Comfort.

F-15Es out of Aviano Air Base, Italy, and RAF Lakenheath in the UK would also take part in air operations over the Balkans between late 1993 and 1999, from Operation Deny Flight, through Operation Deliberate Force, to Operation Allied Force. A number of firsts during this time included the first USAF F-15E employment of the GBU-15 glide bomb, the AGM-130 stand-off air-to-ground missile and the dual use of Strike Eagles as both fighters and bombers, indulging in air-to-ground and combat air patrols often in the same mission.

Just weeks after the September 11 attacks in New York, F-15Es were rushed to Kuwait to support Operation Enduring Freedom over Afghanistan. As well as targeting Taliban headquarters, the Strike Eagles would find themselves putting the 'close' into close-support. In fact, two F-15Es of the 391st spent nearly 16 hours in

the air – nine of those over the target – on one mission. They attacked two Taliban command and control facilities and had to refuel 12 times during the mission from the support tankers. It was reportedly the longest fighter/strike mission ever flown.

Operation Iraqi Freedom to now

By the time the F-15E Strike Eagle 'returned' to Iraq in early 2003, it was a

seasoned warplane.

During Iraqi Freedom, F-15Es were credited with destroying 65 Iraqi aircraft on the ground and 60% of the Iraqi Medina Republican Guard, as well as destroying many vital command and control buildings in and around Baghdad. One F-15E crew, Captain Eric Das and Major William Watkins were posthumously awarded the Distinguished Flying Cross and Purple heart for performing a vital mission in



support of special forces operatives on April 7, 2003.

With the rising of the so-called Arab Spring from 2010, F-15Es participated in Operation Odyssey Dawn, which was part of the Libyan 'No-Fly' Zone enforced from March 17, 2011. Four days later the crew of a Strike Eagle were successfully rescued by US forces after they were forced to eject over Benghazi – then held by the Libyan resistance.

The ongoing battle against Islamic State or Daesh from 2014 has also seen the Strike Eagle play a leading role. Operation Inherent Resolve has been the USA's main thrust against Islamic State in both Iraq and Syria, while USAF F-15Es also flew long-range missions from RAF Lakenheath to hit IS-targets in Libya. Much use has been made of footage taken from the F-15's AN/AAQ-33 SNIPER targeting pods and – according to press reports – strikes by

the F-15Es have also led to the deaths of several prominent Islamic State leaders.

With the USAF's Strike Eagle force undergoing a Radar Modernization Programme (RMP) with the first Raytheon AN/APG-82 being delivered at the end of 2010, as well as upgraded weapons, the F-15E Strike Eagle was destined for a long service life on the frontline, their most recent campaign being over Iran in 2026, which we will address in a later chapter. ➤



Around 100 Strike Eagles may well serve the US until the 2030-2040 timeframe.

The Multirole Eagle is born

Once more the tactical use of the F-15 in a multirole guise was pioneered by the Israelis.

In October 1985 and in a daring raid called Operation Wooden Leg, six F-15Ds from No.106 Spearhead squadron and two F-15C Baz machines, from 133 Twin Tail squadron flew more than 1200 miles from bases in Israel to hit the Palestinian Liberation Organisation's headquarters in Tunisia. The strike was in response to the alleged murder of three Israelis on a yacht anchored in Larnaca, Cyprus, whom the PLO said were spies. The mood from the Israelis was hot: Defence Minister Yitzhak Rabin said: "The IDF will always find and punish those responsible." The go-ahead for the mission was given by Prime Minister Shimon Peres.

The distance – from Israel and across the Mediterranean – was (at the time) the longest-range strike put together by IAF aircraft, the longest since the famous 1976 'Raid on Entebbe'. The target was the PLO HQ in Hammam Chott, near Tunis which was around 1280 miles from Tel Nof, from where the F-15s would be launched.

Everything came together in this raid – not only the IAF's new air-to-air refuelling capabilities with the two Boeing KC-707 tankers, but also the increased (2000lb) internal fuel of the F-15C/D model Eagles.

With this being the first air-to-ground use of the F-15, it was a time of many 'firsts' for the airframe itself. The F-15A, B, C and D did have some latent (if primitive) ground-attack potential, which was (for various reasons) not pushed forward within USAF service. This meant that the Baz models used by the IAF could use the basic 'dumb' bombs then in service, such as the Mk82, Mk83 and Mk84 general purpose bombs.

For Operation Wooden Leg, more accuracy was needed than that offered by dumb bombs, so the six F-15Ds were equipped to launch the GBU-15. This was a 2000lb guided 'glide' bomb, which was steered to the target via the back-seater. A data-link pod mounted on the Baz's centreline pylon ensured communication between the carrier aircraft and the weapon, which had a range of anything between 10 miles and 25 miles.

Joining the six F-15D two-seaters were the two F-15Cs, armed with six 500lb Mk82s general purpose bombs on MER (multiple ejector racks) attached to the Baz's centre pylon – these would be the last into the target. All the Eagles flew with AIM-7F Sparrows and Sidewinder IR missiles as well as their internal cannon for any self-defence issues.

The mission itself was a feat of both logistics and tactics. A picket ship with a search and rescue helicopter was stationed in the Med to be ready to pick up any downed pilots. And the IAF F-15s had to avoid radar detection by not only Middle Eastern enemies, but those on the north coast of Africa and the US Navy prowling on the area too.



The Eagle's latent striking power was first used by the IAF in the Middle East as shown by this elderly single-seat airframe, now on display.



Often, two-seater F-15D Baz aircraft would be used as potent strike aircraft.

All aircraft in the mission had any squadron identification marks and national insignia removed – the latter being over-painted with orange squares – and they made it to their targets undetected at around 11am. The formation then split into two flights of four, with a four-minute separation between them. Two of the Eagles suffered issues and were forced to abort. “We felt intense pressure during those few seconds,” said one of the pilots involved. “We had a good dose of adrenaline in our blood, and we were totally focused on our goal. When we reached our destination, we found our targets and fired our ammunition at the target.”

The first three Eagles released their GBU-15s from around 15 miles away from their target. The second flight began its attack, with two F-15Ds releasing their GBU-15s. These were then followed by two F-15Cs, one of which dropped its Mk.82s on the first run. The other made a circle and then recommenced the attack from a different direction because of dense smoke covering the target. They were joined by flight lead, who observed the damage for assessment by the IAF.

The attacks resulted in condemnation from the international community – even from the US (who allegedly helped with intel before the raid). As far as casualties were concerned, Israel claimed that around 75 people were killed — around 60 of whom were PLO members — others claimed up to 56 Palestinians and 215 Tunisians were killed, and about 100 wounded. Official Tunisian sources put the final count at 47 dead and 65 wounded.

If anything, this mission showed the US how potent a strike-configured F-15 could be. Their own F-15 Strike Eagle was already in development and would fly around a year after Operation Wooden Leg. Meanwhile, the IAF would finally get their own version of the Strike Eagle when it ordered 21 F-15I Ra’am aircraft in January 1994.

The Ra’am’s first combat mission took place in January 1999, and they have been in almost constant use ever since, with many being upgraded. Perhaps the most notable combat mission was Operation Outside the Box, which took place on September 6, 2007. This was a joint F-15I/F-16I Sufa attack on a suspected Syrian nuclear reactor. The Israeli attack Eagle force has also been involved in the recent actions over Iran in 2026.

Other notable uses of the Strike Eagle-derived F-15 in the Middle East includes the Royal Saudi Air Force’s use of the F-15S in Yemen since 2009. ■



Like the original Strike Eagle, the Israeli version benefits from two-crew communication and halving of the workload.



Also like its US counterparts, the Ra’am is more than able to defend itself!



It’s looking likely the Ra’am fleet will be joined by an EX Eagle II derived machine in the coming years.



The mighty Eagle II looks like the Eagles of old, but the differences are many. In effect, it's a completely different aircraft.

The Eagle's Eyrie

More than 1700 F-15 airframes have come off the McDonnell Douglas/Boeing production line over the last 50 years and with the USAF's F-15EX Eagle II, they continue to do so today...

The first prototype of the F-15 was big, brash, powerful and expensive – but even so it was clearly seen that the Eagle's airframe was ripe for development and overseas sales: if only a nation other than the USA could afford it.

The overall shape of the F-15 was so 'right' from the outset that it's hard to spot the differences between the first 'TF-15' and today's cutting-edge F-15EX Eagle IIs

that are currently rolling off the production line for the USAF.

The prototypes

The overall shape of the McDonnell Douglas F-15 was proven with the use of three RPRVs (see Chapter 1) which gathered much data on the overall aerodynamics of the F-15. These 23ft-long 'models' with a 16ft wingspan were around three-eighths the size of the full-size Eagle

and were dropped from NASA's Boeing NB-52 Stratofortress. After the first flight of the actual Eagle the RPRVs were given to NASA late in 1972 and flown up until the end of 1981.

Twelve original prototypes of the F-15 were built by McDonnell Douglas for trials purposes and based at Edwards Air Force Base, California. The first prototype was F-15A 71-0280 (known as F-1 in-house) and this was rolled out at St Louis on June 26,



F-15A number 71-0280 was the first F-15 to fly: both in this Lockheed C-5 Galaxy and in the hands of test pilot Irv Burrows!



F-15A number 71-0285 seen at Edwards AFB on October 4, 1979.

1972, before being ferried by a Lockheed C-5 Galaxy transporter to Edwards AFB.

This very aircraft was the first full-size Eagle to take to the skies on July 27, 1972. The pilot chosen for this big event was Irving 'Irv' Burrows who remarked: *"Wow! It flew just like it did in the simulator."* This first airframe explored the overall flight envelope, handling trials and initial stores carriage before the second aircraft – 'dash 0281' or F-2 which first flew on September

26 and was used to test the then-new-to-service Pratt & Whitney F100 engine. Before the end of 1972 these would be joined by a third F-15A, '0282' or F-3 used to test avionics and the new APG-63 radar.

For 1973 six further A-model prototypes would join the Edwards test fleet, 0283 (F-4) would be a structural test airframe – this aircraft also using smaller wingtips in a bid to eradicate a buffet issue on earlier machines, 0284 (F-5) flew in March and was

utilised for armament development, being the first F-15 airframe with the internal General Electric 20mm Vulcan cannon. Airframe 0285 (F-6) would fly in May and test the avionics/radar and the fire control system, while F-7/0286 – which first flew in June – was testing external fuel tanks and was joined other airframes for armament testing.

The first two-seater evaluation test with '0290/TF-1' also took place in 1973 on ➤



F-15 (72-0119) was the Streak Eagle – it was so different to a production F-15A that rather than being fitted out for service after its record-setting flights it was repainted and retired to a museum.



The F-15 STOL demonstrator used thrust-vectoring F100 engines.



The McDonnell Douglas/NASA F-15B with 'Quiet Spike' supersonic noise reducer boom.

July 7 followed in August by F-15A '0287 or F-8' – which handled spin recovery testing, necessitating the fitment of the bulky but vital spin-recovery parachute. In 1976 this airframe would be given to NASA for an engine development programme. In October 1973 '0288/F-9' first flew and would also join the engine test team before a life with McDonnell Douglas as a test airframe through to the late 1980s, while a second TF/F-15B would take flight in October as a test and demonstration aircraft. This was the famous machine which was painted in bicentennial markings for a whistle-stop tour of the world in 1976. This would be a hard-worked airframe, becoming as it did the prototype Strike Eagle as well as being the first F-15-based airframe to use the conformal fuel tanks or 'FAST' packs (Fuel and Sensor Tactical) as they were then known.

Come the early new year of 1974 and another A-model, the out-of-synch '0289/F-10', would join the trials fleet helping to further develop radar, avionics and newer electronic warfare equipment. Many of the prototypes would find use with NASA for trials and experiments or with their parent company after the trials had ended.

Research/test/record-breaking variants

McDonnell Douglas F-15 Streak

Eagle: Built for one purpose only – that of breaking a series of time-to-height records (see Chapter 2).

F-15A number 72-0119 was left unpainted and stripped of any unnecessary equipment. Between January 16 and February 1, 1975, it broke eight world records at Grand Forks Air Force Base, North Dakota. Amazingly, the figures showed that the Streak Eagle was some 10 seconds quicker to 15,000ft than even a Saturn V moon rocket. Some five years after the record-breaking flights, it was delivered to the National Museum of the United States Air Force. The records were beaten by a similarly stripped-out Sukhoi Su-27/P-42 Flanker between 1986-1988.

McDonnell Douglas F-15 STOL/MTD:

Originally one of the main 12 prototypes and the first F-15B two-seater to fly, 0290 was much-modified to investigate and conduct research using the F-15 Eagle as a 'STOL' Short-Take-Off and Landing aircraft.

Redesign in 1986-1987 saw the standard 'tailed' airframe receive canard flight surfaces mounted on the intake trunks and peculiar-looking square nozzles which could vector thrust from the Pratt & Whitney F100 turbofans. The 'MTD' stood for 'Manoeuvre Technology Demonstrator.'

McDonnell Douglas F-15 ACTIVE:

0290's next adventure was testing advanced flight control technology with the thrust-vector capability of the airframe/powerplants.

Loaned to NASA from June 1993 it was used as a testbed for a number of



An F-15A (77-0081) of the 32nd TFS (36th TFW) at Greenham Common in June 1977.



An F-15C takes off from Eielson Air Base during a Red Flag mission.



This image shows how the conformal fuel tanks are fitted to the F-15 airframe.

advanced research projects based at the Dryden Flight Research Centre at Edwards AFB. The ACTIVE (Advanced Control Technology for Integrated Vehicles) project looked at improvements in cruise speeds and trim drag reduction during cruise flights or manoeuvres: basically, looking at areas of the flight envelope that would be probed 'in production' by the 5th generation fighter – the F-22 Raptor.

The ACTIVE programme lasted until 1999 but 290 was used until 2008 in research at Dryden for Intelligent Flight Control Systems (F-15 IFCS.) By the time 290 was finally retired in 2009, it was then the oldest F-15 airframe still flying.

McDonnell Douglas F-15B 'Quiet Spike' NASA: Having a USAF serial number ending in 0141, this research testbed was acquired by the National Aeronautics and Space Administration in 1993 where it flew under the tail-code '836'.

This was used in the 'Quiet Spike' programme, where NASA was looking at technology with which the next generation of supersonic transports could overfly populated areas at more than the speed of sound without creating the intense 'sonic booms' that saw Concorde banned from so many of the world's most lucrative long-haul routes in the early 1970s.

The technology was actually a 7.3m long 'spike' which created three smaller shock waves, resulting in much less sound disturbance on the ground. The trials ended in 2007. Other NASA test airframes included F-15A models '0281' and '0287' for various new systems including a Self-Repairing and Self-Diagnostic FCS (Flight Control System) among other systems.

Production variants

McDonnell Douglas F-15A Eagle: The original baseline, single-seat, all-weather air-superiority fighter version of the Eagle. Selected by the USAF back in 1967, it first flew on July 27, 1972, and entered service on January 9, 1976. The basic specification included the Hughes (later Raytheon) AN/APG-63 pulse-doppler radar set and Pratt & Whitney F100-PW-100 engines each rated at 14,760lb of static thrust and 23,830lb in afterburner.

Original armament consisted of the M61A1 Vulcan rotary cannon in the starboard wing-root with 940 rounds. Armament was four AIM-9P Sidewinder short-range infra-red homing missiles and four AIM-7F/M Sparrow semi-active radar-homing missiles semi-recessed on the bottom of the fuselage/intake trunking. A total of 384 F-15As were built between 1972 and 1979.

McDonnell Douglas F-15B Eagle: Originally designated TF-15A, this was the fully combat-capable version of the single-seat F-15A Eagle. Still equipped with the APG-63 radar, 20mm cannon and full fuel and missile complement, the second seat necessitated the loss of some non-essential avionics.



The F-15D is a fully combat-capable two-seater version of the C single-seater, seen here about to refuel in mid-air.

The first F-15B entered service on November 14, 1974. A total of 61 were built between 1972-1979. Several early model A/B Eagles were initially scheduled to go through the MSIP upgrades (see below) but for economic reasons many were donated to museums while a number were given to the IDF-AF as thanks for Israeli restraint during the 1991 Gulf War.

McDonnell Douglas F-15C/D Eagle:

It was always going to be the case that soon after the introduction of the F-15A a definitive fighter version with various updates would be made – this would become the F-15C. Largely identical to the previous models, space was found for a further 2000lb of fuel internally while the conformal FAST packs were finally available to fit to C/D models of the Eagle.

Other changes were made to the Pratt & Whitney F100 engine. Early C/Ds were powered by the existing F100-PW-100 motors, but things were to change. Due to some early teething problems with the F100, the C/D models would (eventually) get the much more reliable (if slightly less

powerful) F100-PW-220. Internally, avionic changes were also made. The first F-15C/Ds would benefit from the AN/APG-63 PSP (programmable signal processor) radar from Hughes (later Raytheon) and improved electronic warfare/electronic countermeasures equipment.

The first F-15C (78-0468) flew from McDonnell Douglas' St Louis plant on February 26, 1979, with the F-15D flying on June 19. These first examples would use the earlier PW-100 motors, but from 1985, all production F-15C/Ds would use the PW-220. The radar would also be improved during the C/D's production. From 1989 the AN/APG-70 radar was fitted to the last 43 F-15Cs delivered. This was a much-improved version of the very successful APG-63 set. Improvements in electronics over time meant more processing power for the APG-70 (five times quicker than the 63) while other small improvements would come over time, including the allocation of the AN/APG-63(V1) radar and subsequent upgrades that are planned for the 'Golden Eagle' fleet survivors.

This was part of the MSIP II (Multi-Stage Improvement Program II) which saw a number of upgrades, including the APG-70 (and subsequent ability to launch the 'fire and forget' AIM-120 AMRAAM) as well as some other notable upgrades. These included an overload warning system to help stop pilots over-G-ing the airframe, jamming-resistant radios under the Seek Talk programme, GPS navigation, a new Electronic Warfare Warning Set with the introduction of the Tactical Electronic Warfare System (TEWS) along with the ALQ-135 ECM set and ALR-56C RWR (Radar Warning Receiver). Also included was the JTIDS or Joint Tactical Information Distribution System which reliably allowed information to be shared quickly between aircraft and ground forces including control centres. The first MSIP II F-15C flew on June 20, 1985.

A total of 483 F-15Cs were manufactured for the USAF and exported between 1979 and 1985 with 92 F-15Ds being built over the same timescale.

McDonnell Douglas F-15J Eagle: Single-seat version of the air-superiority fighter built for (and by) the Japan Self-Defence Force.

Two were originally built by McDonnell Douglas in St Louis, with the remaining 139 built under licence in Japan by Mitsubishi Heavy Industries during 1981-1997. Based on the C-model, the only major difference was the deletion of the USAF version's ECM radar warning and latent nuclear weapon delivery ability. The F-15DJ is essentially the same as the B/D Eagle, with 25 built in Japan and 12 by MDD in the USA.

Around 100 of the surviving aircraft underwent a mid-life upgrade to bring them largely into line with the USAF's MSIP II. Updated engines, radar and computer systems as well as indigenous missiles both short and medium range keeps the F-15J/DJ fleet current in today's air-to-air climate.

McDonnell Douglas/Boeing F-15E Strike Eagle: A derivative of the two-place F-15 airframe equipped with conformal



Japan has (so far) been the only licenced manufacturer of the F-15.



The F-15E Strike Eagle was designed for the air-to-ground role in the mid-to-late 1980s and entered service in 1989-1990: it still serves in the USAF to this day.



The F-15I Ra'am is the IAF's own version of the F-15E, but with many Israeli systems fitted.

fuel tanks (CFTs) finally utilising the latent ability of the Eagle to drop bombs and hit ground targets.

These basic abilities were brought together in a McDonnell Douglas-funded company demonstrator to prove the concept of the 'Strike Eagle', basically a long-range interdictor or 'bomb truck' but one which had a useful self-defence capability.

The second 'TF-15' airframe (0291) was modified and flew on July 8 as the Advanced Fighter Capability Demonstrator. It was a timely move as in March 1981 the USAF announced the Enhanced Tactical Fighter Programme to search for a successor to the General Dynamics F-111 low-level strike aircraft. The F-15E was selected in 1984.

The Strike Eagle used the two-seat F-15 airframe utilising two Pratt & Whitney F100-PW-220/229 engines, married with CFTs to advanced sensors (including LANTIRN – Low-Altitude Navigation and Targeting Infra-Red for Night), updated AN/APG-70 radar and a suitable colour scheme for the low-level strike role.

It's been since developed into a variety of sub-types for various air forces. As the F-15E Strike Eagle for USAF service, around 236 were built between 1985 and 2001, seeing its first combat during Desert Storm in 1991.

Updates to keep the Strike Eagle current have included upgrading the radar to the latest AN/APG-82 AESA radar from 2007. Around 100 will still be serving around 2030-2040 with upgrades to the ECM suite and other key areas.

Boeing F-15I Ra'am: Ordered following the 1991 Gulf War, this was in response to Israel's need for a long-distance strike aircraft, following the IDF-AF's successful use of the two-seat Baz in this role.

Following this is a made-for-Israel version of the F-15E. The Ra'am (Hebrew for 'Thunder') is powered by the same P&W F100-229 combination as the F-15E but crammed with indigenous Israeli electronic equipment: most notably the use of a pilot's (and WSO's) helmet-

mounted sight, initially giving the F-15I this advantage over the USAF's F-15E until the adoption of the Joint Helmet-Mounted Cueing System in 2010.

Other, locally produced, equipment includes Israel's own RWR (Radar Warning Receivers) as well as the Elisra SPS 2110 EW (Electronic Warfare) suite and GPS/navigation systems. It also uses the Ra'am-specific AN/APG-70I. This version of the venerable AN/APG-63 and its derivatives gives ease of maintenance, using some ➤



Ordered in 2002, the first of the ROKAF's 'Slam Eagles' were delivered in 2005: like the Japanese Eagles and the IAF's models, the engines are licence-produced and the airframes have a number of home-made components.

common modules from both the APG-73 of the F/A-18 Hornet and some from the APG-71 seen on advanced versions of the US Navy's Grumman F-14 Tomcat.

On IDF-AF Ra'ams, it's reported that the air-to-air modes are identical to those on the USAF's Strike Eagle force, which means it can detect a large airliner-sized target at 170 miles (280km), and fighter-sized targets at 64 miles (104km). The air-to-ground performance and resolution is not so high as the American aircraft, reportedly only two-thirds of the performance of the USAF F-15E. Podded sensors have included both Sharpshooter and LANTIRN.

Israel first used the Ra'am in anger during 1999 and the aircraft will feature in the IDF-AF's lineup for some years to come. It will therefore be subject to a number of upgrades. It was announced in January 2016 that the Ra'am fleet will be upgraded structurally and with new avionics, including an AESA radar and new weapons systems.

Boeing F-15K Slam Eagle: Another offshoot from the F-15E Strike Eagle family, the F-15K 'Slam Eagle' serves the Republic of Korea Air Force in versions with two different powerplants.

The first 40 aircraft ordered from 2002 are powered by the General Electric F110-GE-129 motor, with 21 ordered from April 2008 under the 'Next Fighter II' programme being powered by the Pratt & Whitney F100-PW-229 EEP (Engine Enhancement Package) motor. Depending on what spec sheet you believe, there's only a few hundred pounds of thrust between the two – in the GE motor's favour: (29,160lb in afterburner compared to the F110's 29,400lb).

The Slam Eagle was ordered by the Republic of Korea in 2002, with first deliveries commencing in October 2005 and the last of the 61 aircraft (of either powerplant) being delivered in 2012. ROKAF's Slam Eagles feature a high



The Saudi 'SA' (Saudi Advanced) Eagle, uses the GE F110-GE-129C engines and a digital fly-by-wire system as well as advanced ECM and weapons gear.

degree of licence-built components, with South Korea producing 40% of the parts for each machine and 25% of the final assembly, including fuselage and wings from Korea Aerospace Industries. The Pratt & Whitney F100 engines and General Electric F110 motors are also licence produced.

Up front the radar is a development of the AN/APG-63(V)1 used in the F-15C, with air-to-ground elements of the AN/APG-70 added to meet Korea's needs more adequately (notably in the sea/surface track modes).

The result is one of the most flexible fighter/bomber radars in use today and one which can be easily upgraded with an AESA radar array in the future. The modern cockpit is fully night-vision goggles capable as well as using the Joint Helmet Mounted Cueing system (JHMCS). Weapons include the latest AIM-9X Sidewinder, AIM-120C AMRAAM (both can be used with the AAQ-14 pod for infra-red search and track engagements) AGM-84H Harpoon Block II anti-ship missile, AGM-84K SLAM-ERs and in the future any new 'stealth' stand-off missiles currently in development. Two Slam Eagles have been lost in service as of April 2026.

The Slam Eagle beat many '4.5' generation aircraft to win the contract – including the Dassault Rafale, Sukhoi Su-35 and Eurofighter Typhoon. With various upgrades, the Slam Eagles are expected to be in service until 2060.

Boeing F-15S Eagle: Following the F-15E's performance in Desert Storm, the Royal Saudi Air Force showed interest in a version of the Strike Eagle. They initially looked at a single-seat F-15F version (see below) but in the end were able to order the F-15XP (Export) later called the S for Saudi.

After much political to-ing and fro-ing, it was finally announced in October 1992 that the RSAF was allowed to purchase a version of the Strike Eagle under the 'Peace Sun' project name, one of the most lucrative US military aviation deals then completed. The F-15XP became the F-15S and was – effectively – a slightly downgraded version of the E-model.

The RSAF initially bought 72 aircraft, utilising the Pratt & Whitney F100-PW-229 powerplant and from that total around 48 were going to be fully configured for the air-to-ground role, although all would be multirole and use CFTs. The S-model made its first flight in June 1995 and deliveries commenced soon after until completed in 1999. Performance was (once more) downgraded, similarly to the F-15L, with the AN/APG-70's capabilities being less than that of the USAF Strike Eagle force, as was the performance of other sensors, including the LANTIRN pods supplied.

Boeing F-15SG Eagle: In 2005 the F-15SG was chosen over the Dassault Rafale following a seven-year evaluation against a number of modern aircraft to provide the Republic of Singapore Air Force with its multirole clout, replacing the retired McDonnell Douglas A-4SU Super Skyhawks.

As a result, an order for 12 F-15SGs was placed with Boeing. These would be powered by the General Electric F110-GE-129 turbofan capable of more than 29,400lb of thrust. The radar would be the AN/APG-63 (V)3 AESA with full air-to-air and air-to-ground capabilities. Included in



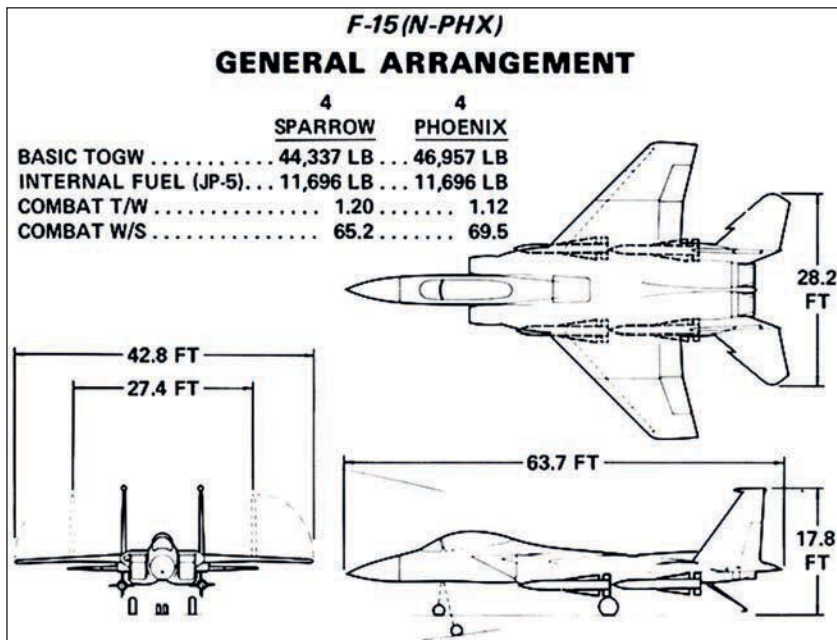
Singapore purchased the potent F110 powered SG model, which used Link-16 and night vision goggles.



Seventy-two of these 'Qatar Advanced' were ordered in 2016 and two kills have apparently been made by the fleet in 2026.



The latest Eagle for the USAF is the potent and capable EX Eagle II.



The Sea Eagle was discussed in a number of versions, some with only Sidewinder/Sparrow and some including the long-range AIM-54 Phoenix missile: but the Sea Eagle could only carry four, compared to the F-14's six...

the deal were AMRAAMs, 9X Sidewinders and AGM-154 JSOWs.

The cockpit came with and was suitable for NVG operation (Night Vision Goggles) while the aircraft were able to use the Link-16 datalink to share information with other aircraft. The first machine was rolled out in November 2008 and delivered the following May with final deliveries ending in summer 2017.

Boeing F-15SA (Saudi Advanced)

Eagle: Following on from the successful introduction of the F-15S into RSAF service in the 1990s, the F-15SA has since entered service as both a new-build variant of the potent strike-fighter as well as an upgrade to existing F-15S airframes.

The biggest change is to the powerplant, with the General Electric F110-GE-129C engine replacing the Pratt & Whitney F100. In a \$300 million contract, GE sold 65 engines to power/replace the P&W F100s in existing F-15S aircraft.

In addition, the SA-model uses a modern digital fly-by-wire FCS (flight control system/DFBW) uprated EWS (electronic warfare systems, the BAE Systems' Digital Electronic Warfare System (DEWS) and Common Missile Warning System (CMWS) and all-new cockpit with large area displays, helmet-mounted displays (as well as a Wide Field of View (WFOV) HUD, the AN/AAS-42 'Tiger Eyes' infra-red search and track system (IRST) and the AN/APG-63 (V)3 AESA radar.

The deal for the production of the F-15SA was announced at the end of 2011 and the agreement covered the production of 84 'new-build' F-15SAs and the upgrading of 70 F-15S machines from the RSAF inventory, as well as back-up, training and spares/sensors and weapons, including the AN/AAQ-33 SNIPER advanced targeting pod.

In air-to-air guise the F-15SA can carry up to 16 air-to-air missiles (the latest AIM-9X off-boresight short-range AAM and the AIM-120C-7 AMRAAM) – utilising the outboard wing hard-points for the first time: that's double the typical loadout of the F-15C pure fighter. Air-to-ground the SA packs a thoroughly modern punch, utilising AGM-84 SLAM-ERs, JDAMS, the GBU-39 SDB (Small Diameter Bomb) as well as anti-radiation HARMs. The first aircraft flew in February 2013 and the first RSAF aircraft was delivered at the end of 2016. Initial snags were found when developing the digital fly-by-wire (DFBW) control system with more than 18 months spent in testing.

Boeing F-15QA Eagle: Similar to the SA Eagle, 72 examples of the QA (Qatar Advanced) were ordered late in 2016. This also features the General Electric engine, the AN/APG-63 (V)3 AESA radar, up-to-date EW equipment, full DFBW systems and advanced sensors/targeting pods and weapons.

Boeing F-15EX Eagle II: This is the latest version which is entering USAF/ ➤

ANG service to replace the elderly F-15C/D fighter versions – and possibly the older F-15E Strike Eagles, in the future.

Although it's designed as a two-seater, it's envisaged that many missions will run with a single pilot only. Updates compared to legacy fighter and Strike Eagles include a full, fly-by-wire flight control system, full digital systems, the latest General Electric GE F110-GE-129 engine, ECM systems (the Eagle Passive/Active Warning and Survivability System), advanced mission computers and displays and the most modern weapons.

The Eagle II entered service in 2024 and – at the time of writing – no more than around 30 have been delivered.

'Paper projects'

McDonnell Douglas F-15N Sea Eagle: With the high-cost implications and doubts concerning the General Dynamics F-111B from the late 1960s and the Navy's replacement interceptor – Grumman's F-14 Tomcat – the F-15N was almost considered to be a 'safe option' to the riskier Tomcat programme.

Two versions were mooted, the first initially in 1971. This was to be a basic 'navalisation' of the standard F-15A airframe. By this time the first flight was a year away, but the design was mature and being 'tested' in McDonnell Douglas' advanced simulator.

This F-15N then would simply carry the same Sidewinder/Sparrow armament as the baseline F-15A, with the Hughes AN/APG-63 radar. Navalisation would come in the form of folding wingtips and a much-reinforced landing gear and tailhook for repeated carrier landings. Despite these additions making the standard F-15A some 3100lb (1409 kilos) heavier in the F-15N, McDonnell Douglas (with huge experience of carrier-borne fighters thanks to the previous F-4 Phantom II) was confident that the agility, speed and excellent thrust-to-weight characteristics of the Eagle would make for a superb US Navy interceptor.

The key here was the issues coming forth with the F-14's powerplant – the Pratt & Whitney TF30, which was already showing signs of weakness. It was thought the P&W F100 offered improved reliability – although history would prove that the otherwise reliable and tough F100s would have their own fair share of early teething troubles on both the F-15 and subsequent F-16 aircraft.

The next issue was armament fit and range. The F-111B's AN/AWG-9 radar and Hughes AIM-54 Phoenix long-range (around 100 miles) were carried over to the F-14 and it was felt that some longer-range missiles other than the AIM-7F Sparrow (around 40 miles max range) was required in the over-water interceptor role, where fleet defence had to keep the enemy – often seen to be long-range Soviet bombers with their own long-range anti-ship missiles – at maximum distance from the carrier battle group.

F-15s for the Royal Air Force?

ACCORDING to a report in *Interavia AirLetter* the Royal Air Force is considering buying F-15 Eagle interceptors to plug the gap in UK air defences which will exist until the Tornado F.2 (ADV) enters service in the mid-1980s. Three possible purchases are postulated: a small buy of 24 F-15C/Ds to 'top up' RAF fighter strength; replacement of the present Phantom/Lightning force by 60-80 Eagles; or a decision to cancel Tornado F.2 and buy more than 150 F-15s fitted with the Marconi Avionics fire-control radar and British Aerospace Sky Flash radar-guided air-to-air missile armament planned for interceptor versions of the Panavia fighter.

In a world where a single stroke of the presidential pen can effectively cancel a project like the B-1, anything is possible, but on the surface an F-15 deal has little to recommend it. Officially, the idea is a non-starter. *Flight* reported last week that the service had considered leasing F-15s, but that according to the Ministry of Defence RAF future plans were unlikely to include the F-14 or F-15.

Reactions on the other side of the Atlantic are equally cool. McDonnell Douglas claims to have heard nothing: 'We have not been approached by the British.' This line is echoed by the US Department of Defence.

Flight understands that RAF planners have investigated purchasing US-

surplus F-4 Phantoms as an interim boost to front-line fighter strength, and that discussions on the F-15 have been at only a low level. The RAF see the F-15 as being less suitable than the two-seat Tornado F.2: Britain requires a long-range interceptor to counter Backfire/Fencer-class low-level intruders rather than a high-performance air-superiority fighter. The Hughes APG-63 radar is also considered to be more vulnerable to electronic countermeasures than its UK counterpart (see *Flight* for August 26, page 604).

One RAF officer close to the Tornado programme tells *Flight* that the Marconi-Elliott radar – popularly, but not officially, known as Foxhunter – was designed from the outset to be highly resistant to hostile jamming or deception. Radar technology has, in his opinion, reached the point when any sensible value of range which a defence planner cares to specify can be obtained. Resistance to jamming is the most important single attribute which is going to be required of radars in the late 1980s and 1990s.

No real savings would result should the F-15 be chosen to carry Foxhunter rather than Tornado. Fly-away cost of an F-15 equipped with the British radar would not be significantly different from the £2.4 million quoted for Tornado F.2, while cancelling the European fighter could further swell the final bill. *Interavia*



AirLetter suggests that as an offset the USAF could buy a wing of interceptor/strike Tornado FG.1s to replace the 72 F-111Es based in the UK.

Production-standard F-15C/Ds could well be available to the RAF earlier than Tornado interceptors. Saudi Arabia, for example, expects to take delivery of its first aircraft in 1981-82. Unless the timescale of Tornado ADV airframe development is slipping badly, it would be no quicker to integrate the British radar into the F-15 than to wait for the European aircraft. If F-15s are bought or leased, valuable commonality between RAF strike aircraft and interceptors would be lost.

Although Foxhunter-equipped F-15s bearing RAF roundels seem unlikely, the combination could prove attractive to Australia and Canada, both of whom are in the market for new fighters. British military aircraft procurement since the 1950s has tended to be one long story of promising projects cancelled for reasons thought good at the time. Only a handful of designs such as the Harrier show what might have been. Given this sort of track record, only a brave man would totally discount the possibility that Eagles might one day sport RAF colours.

USAF axes the remotely-piloted vehicle

HAVING spent \$1,800 million since 1949 on remotely piloted vehicles (RPVs), the US Air Force has decided to kill off the concept of the unmanned reconnaissance / electronic warfare drone. At one time the service considered an all-RPV force equipped with strike and fighter drones, but in a complete turnaround the existing reconnaissance RPVs and support aircraft will be transferred to the Air Force Reserve next year. The electronic warfare RPVs will be decommissioned simultaneously.

Based at Davis-Monthan, Arizona, the present force comprises 117 AQM-34 drones, 12 DC-130 Hercules launch and control aircraft and ten CH-53 recovery helicopters. The 57 reconnaissance RPVs to be transferred will be retained for possible use in the event of war and fitted with improved mid-course guidance control and infra-red surveillance equipment.

In the heavy jamming environment of wartime Europe it may prove impossible to control RPVs, the USAF feels, and the survivability of the DC-130 control aircraft, both in the air and on the ground, is questionable.

Europe is already short of hardened shelters. A chaff corridor would need multiple drone formations to be effective, and current Air Force equipment is incapable of controlling large numbers of drones simultaneously. A five-year programme to convert nine DC-130s into formation controllers would cost \$450 million.

Over the next few years the Air Force will continue to acquire AQM/BGM-34 drones to compensate for attrition, but the total programme cost has been cut from \$336.7 million to \$100.4 million. Unit cost of the remaining 20 RPVs will therefore increase from \$1.99 million to \$2.56 million.



General Dynamics technicians attach the first set of wings built by Sabca in Belgium to an F-16 on the Fort Worth production line

The idea of buying the F-15 and even the F-14 was mooted in the UK, but not for very long: the UK's 'own' interceptor – the F2/F3 version of the Tornado strike-fighter was developed instead, but this was neither as capable and took many years to mature into a decent fighter.

Many in the US Navy felt that the Phoenix was a must for their next generation interceptor so a further F-15N, called the F-15N-PHX was discussed where the semi-recessed AIM-7 Sparrow stations on the shoulders of the intake trunk would be configured to carry four of these huge missiles (the F-14 could carry six as a maximum load) along with either an adapted AN/APG-63 radar to launch the AIM-54 or the AWG-9. A perfect fit? Well, maybe not. Versions of the Phoenix-equipped F-15N Sea Eagle would have weighed around 9000lb (4090 kilos) more than an F-15A.

While the sheet specifications would perhaps show that the F-15N would have been more agile than the F-14 Tomcat, the creeping weight increase would have meant that the Sea Eagle would have lost its edge over the land-based equivalent. One big positive: cost. Compared to the \$38 million each F-14A Tomcat would eventually cost, the F-15 cost just \$28 million per aircraft. This cost comparison though was for the

F-15A – so it's best to add a fair few million per F-15N for development costs...

Despite the Sea Eagle proposal – as well as possible advanced F-4 Phantom derivatives – the F-14 programme had its own big backers at the Pentagon and in the Navy and it made it through into production. Why? Well, many were still shivering at the big problems thrown up by the forced commonality of the F-111 USAF/Navy, so it's little wonder that there wasn't any metal cut for the Sea Eagle, let alone a fly-off as proposed by some politicians. There was even talk of an F-14 Tomcat being configured for the USAF as a Convair F-106 Delta Dart replacement – the interceptor then protecting the continental United States, but politics and inter-service rivalry and mistrust killed that 'Cat' and F-15s and F-16s would instead do the job and supplement F-4s in the role.

So, by 1973 – and with both aircraft in the air and into their respective trials – the Navy stuck with the Tomcat and the Air Force with the Eagle. Probably common

sense was served as the Eagle was a true air-superiority fighter/interceptor while the F-14 was the reverse. Still, how would the Miramar Naval Fighter Weapons School ramp known as 'TOPGUN' have looked filled with Eagles? And just think of the 1986 film of the same name. It wouldn't have been the same using single-seat F-15Ns. No Goose?

One thing that did come out of the various senate hearings was the formation of the Navy Fighter Study Group 4. As the years progressed this would lead to the adoption of a navalised version of the Northrop F-17 Cobra, which would become the McDonnell Douglas F/A-18 Hornet. So MDD would win out in the end with a navalised land-based fighter, but that was some years into the future.

McDonnell Douglas F-15C/D (UK):

Yes, the mighty F-15 was once discussed as a possible Royal Air Force fighter. *Flight International* of September 9, 1978, published rumours that the F-15 was being considered as a 'stopgap' fighter pending the introduction of the just-flown Panavia Tornado ADV/F.2.

With the ADV/F.2 not considered to be 'in service' until the mid-1980s, there were several schools of thought as to how an F-15 purchase would work. Either a small number of F-15C/Ds then just about to come into service with the USAF would be bought as a 'top-up' to the F-4 Phantom and BAC Lightning force then guarding the UK Air Defence Region (UKADR) – some sources say just 24 aircraft. The second choice was for a larger number of around 60-80 Eagles to replace the F-4Ms and Lightnings while the ADV Tornado

matured or an all-out purchase of more than 150 Eagles instead of the Tornado F.2 and as a replacement for all other air defence types then in service.

Of course, things weren't quite as simple as all that. Despite the horrendous error of fielding an F-4 with more powerful British engines (the Rolls-Royce Spey) which resulted in an inferior (in respects of speed thanks to increased drag and overall ceiling) aircraft, this RAF F-15 would also have British equipment to make it more politically acceptable. This was thought to be at the time both the Marconi Avionics AL.24 pulse-doppler radar – later called 'Foxhunter' as well as the BAE Skyflash missile (an updated version of the American Sparrow medium-ranged radar-guided missile) and other various British-built subsystems.

The irony is that – in the *Flight International* article – it was thought that the future AL.24 Foxhunter radar would be much more resistant to jamming than the AN/APG-63. And yet of course the Foxhunter radar would have its own issues and wouldn't mature quickly enough to match that of the ADV airframe, leading to radar-less F.2s using concrete ballast for some time.

The other option was merely to 'lease' the American aircraft, not such a mad idea and one which (ironically) Italy did with the Tornado F.3 fighter and F-16 to replace the Lockheed F-104S interceptors while it waited for the Eurofighter Typhoon.

So why didn't the UK F-15 materialise? As usual, it was a mixture of politics, economics and a dash of military reality.

Firstly, the United Kingdom is like one giant aircraft carrier, so the fighter

that the RAF sorely needed was a long-range interceptor, one more akin to the F-14 Tomcat with its long-range missile armament. The BAC Lightnings were notoriously short-legged and – even by 1978 – only so many F-4M squadrons were dedicated to air-defence. Economically and politically, it didn't seem worth the money or effort to change the F-15's systems for British ones and – with Saudi interest in the fighter version of the Tornado – the ADV project went ahead.

So, the 'fighter shortfall' was never filled – at least not at that time. At the time of the possible F-15 deal it was also suggested that extra F-4 Phantom IIs should be sourced from the USA. Again, these plans weren't pursued – at least not until 1984.

Following the Falklands War of 1982, an RAF presence with a section of F-4Ms was based at Mount Pleasant, leading to a shortfall once more for the RAF in the UK and Europe. With rumours of F-15 Eagles and F-14 Tomcats again doing the rounds, instead 15 F-4J airframes were brought out of mothballs and refurbished and entered service in October 1984. They kept all the US equipment – including the J79 engines, giving better high-altitude performance. They were retired in 1991, a year prior to that of the RAF's main Spey-powered F-4 fleet.

McDonnell Douglas F-15G Wild

Weasel VI: Following on from the F-4G Wild Weasel V, the proposed F-15G would follow the Phantom's role with a two-seater to handle the high-workload of the Wild Weasel's Suppression of Enemy Air Defences (SEAD) role over the battlefield. The F-15G was first discussed as far back as 1985 (curiously along with a USAF ➤



This 'Advanced Eagle' QA wears a scheme similar to the original F-15 of 1972.



This 'Silent Eagle' featured outward canted (stealthy) tails and internal weapons bays.

version of the Panavia Tornado) where two-seat F-15s – most probably close to the specification of the then flying Strike Eagle – would see a full sensor suite developed from the APR-47 used successfully in the F-4G as late as Desert Storm in 1991.

Another proposal looked at in the mid-1990s was to use F-15C single-seaters in the role (perhaps similarly as RAF Tornado F3s were used with BAE ALARM anti-radiation missiles). Both types would have employed the latest anti-radar missiles then in the USAF armoury, both Standard Anti-Radiation Missiles, (ARMs), Shrike or AGM-88 High-speed Anti-Radiation Missiles (HARMs) as well as standard munitions to help take out the surface-to-air missiles

(SAMs) themselves. In the end the General Dynamics/Lockheed Martin F-16CJ Block 50/52s – with its 'weasel in a can' system (the ASQ-213 HARM Targeting System or HTS) was selected. Basically this was the F-4G's system, updated, miniaturised and put into a pod.

McDonnell Douglas RF-15 'Sneak/Peek Eagle': This was the very unofficial name for a replacement for the USAF's fleet of McDonnell Douglas RF-4Cs (and perhaps foreign-service RF-4Es) that were still in service in large numbers in the mid-1970s. Like its predecessor, the RF-15 would have featured a new nose, probably with a somewhat simpler radar, but equipped

with optical cameras, SLAR (Side-Looking Airborne Radar) and other updated equipment. No aircraft were built, despite a 1988 USAF requirement to replace RF-4Cs and the RF-16 being also mooted. Today it seems that tactical reconnaissance is the realm of the UAV/RPV fleet.

McDonnell Douglas/Boeing F-15

MANX: Another stillborn project, this was the name for a tailless variant of the F-15 ACTIVE, but no aircraft was so modified.

Boeing F-15F Strike Eagle: Originally a proposed single-seater for Saudi Arabia, the F-15F would use the twin-place airframe, including the E's engines, radar and cockpit multi-function displays. The Saudis originally ordered 24 of this type (ironically, along with 48 two-seaters that were combat capable). Eventually the Saudis settled on their own version of the F-15E, the F-15S.

Boeing F-15H Strike Eagle: This was a proposed export version of F-15E Strike Eagle for Greece (H for Hellas/Hellenic) to replace both the F-4E Phantom II and A-7 Corsair in the attack role. Instead the Hellenic Air Force opted for the F-16C/D Block 52+ and Dassault Mirage 2000-5 multirole fighters. Moving forward, the F-15H is not planned to move forward, despite the air force looking towards 4.5 or fifth-generation aircraft to replace older types.

Boeing F-15 Advanced Eagle:

Essentially the basis for the 'Advanced' models sold to Saudi Arabia and Qatar and later the USAF EX Eagle II. The Advanced Eagle utilises the option of the General Electric GE F110 engine, two additional hard-points under the wings, full digital fly-by-wire controls, the latest BAE EW equipment, AN/APG-63(V)1-3 or APG-82,



A render of the Indonesian model of the EX was used extensively in PR for a number of defence shows.



At the end of 2025, it was confirmed that the Israeli Air Force would purchase the next generation of Eagle II-based strike-fighters.

NVG and helmet-mounted sight capability, up to 16 (or more) AAMs in the fighter role or the very latest in air-to-ground and 'stand-off' ordnance.

Boeing F-15 Silent Eagle: This was a 2009 proposal which would marry some 5th generation fighter elements into the proven 4th generation F-15E airframe. Twin-canted tails and RAM (Radar Absorbent Material) would reduce the radar cross section (RCS) of the F-15, as would the use of conformal weapons bays (CWB). The first demonstrator flew in July 2010 but without the altered tail configuration, testing instead a left-side CWB from which it fired an AIM-120 AMRAAM. A lack of orders sealed the Silent Eagle's fate, but some technology has transferred to the current F-15 production line.

Boeing F-15 2040C: This was the proposed upgrade to the F-15C, allowing it to work with the Lockheed-Martin F-22 Raptor in the pure fighter role. Assuredly multirole, however this version has a fighter slant with the inclusion of multi-adaptor points to carry around 16 (or more) air-to-air missiles, CFT (conformal fuel tanks) for longer range, the latest AESA version of the APG-63, and the Talon HATE communications pod for data-transfer with 5th gen fighters like the F-22 and F-35 Lightning II.

Boeing F-15GA Strike Eagle: a proposed 'German Advanced' version of the QA airframe bought by Qatar. This was for the Luftwaffe as a replacement for their Panavia Tornado IDS/ECR airframes

due to be retired around 2025/2030. Instead, they chose to place an order of 35 Lockheed Martin F-35A Lightning IIs and an additional 15 Eurofighter Typhoons but in an 'electronic warfare' variant.

Boeing F-15CX Eagle II: This was a proposed single-seat variant for the USAF with equivalent capability of the F-15EX. This wasn't followed up on, thanks to increased start-up/tooling costs of making a single-seat 'Advanced Eagle' version.

Boeing F-15EX Eagle II IDN/ID: Export version of the EX Eagle II for Indonesia. The proposed sale was discussed from early 2022 through to signing a MoU (Memorandum of Understanding) in August 2023, but by early 2026 the deal was considered 'no longer active'.

At the time of writing Indonesia has received its first Dassault Rafale jets from France (ordered in 2022) and has ordered Leonardo M-346 trainers/advanced trainers from Italy as well as talking to China about the J-10C, Turkey about its KAAN fighters and South Korea about the KF-21 Boramae project.

Boeing F-15EX Eagle II Thailand: Potential replacement for the Royal Thai Air Force's Lockheed Martin F-16A/Bs. After much discussion in August 2024 the SAAB Gripen E/F was selected.

Ordered/potential variants as of 2026

Boeing F-15EX-SA Eagle II: Around 54

F-15EX Eagle IIs have been mooted for purchase by Saudia Arabia, but this could be at risk from (at the time of writing) the approval of the Kingdom's purchase of the Lockheed Martin F-35. Whether the 5th generation fighter deal goes ahead or not, the Middle Eastern state could still add to its forces with new-build EX Eagle II based machines and update the 84 F-15SA's purchased in 2011.

Boeing F-15EX-EG Eagle II: An agreement was made back in March 2022 for the sale of 'advanced' Eagle variants, as many as 46 for Egypt – following the cancellation of an order for the Sukhoi Su-35. If the order gets the go-ahead, deliveries will be from 2028.

Boeing F-15EX Eagle II PO: As of the end of 2025, the F-15EX Eagle II (or a variant of) was being aggressively marketed by Boeing to the Polish government. Around 32 orders are up for grabs along with associated weaponry and equipment.

Interestingly, the engine choice would be the Pratt & Whitney F100 and not the GE F110 as Poland uses the F-16 with this engine. A decision is expected soon, at the time of writing (mid-2026).

Boeing F-15IA Eagle II: Israel signed a contract in December 2025 for 25 F-15IA (Israeli Advanced) based on the F-15EX Eagle II airframe, with an option for an additional 25. It is thought this could include 'kits' to turn original F-15Is into IA standard. ■



Advanced Eagle



The USAF's latest version of the F-15 Eagle, the EX Eagle II is heavily based upon the advanced Eagle models such as the QA for the Qataris.

A decade ago, the very thought of any more orders of the F-15 Eagle would almost be sacrilege and a major threat to the F-35 Lightning programme for the US military, but times have changed and a new Eagle has flown the nest...

Even for an airfield so steeped in history, February 2, 2021, was a special day for St Louis International Airport.

St Louis – for so long the home of McDonnell Douglas – had been the scene of the first flight of the legendary F-4 Phantom II on May 27, 1958, so it was entirely fitting that on this day Boeing test pilots Matt Giese and Michael Quinitini would lift off from St Louis for a 90-minute test flight of the new F-15EX fighter.

This aircraft was the precursor to the latest generation of USAF F-15 Eagle; while looking almost identical to the two-seat Eagles that have been on the frontline for five decades, the F-15EX – in-service now since 2024 – is a world away from the first Eagle that flew in the hands of Irv Burrows on July 27, 1972. Interestingly, Irv was a very interested watcher of the EX's first flight via a live video link.

With more than 1700 Eagles built, it was thought that production would cease around 2022 once the last export orders had been fulfilled. This was despite proposals for newer models from Boeing, who had bought McDonnell Douglas in 1996. While these didn't come to fruition; a version heavily based on the F-15QA 'Qatar Advanced' known as F-15EX was eventually selected to initially replace the older legacy F-15C pure fighter models, mainly used by Air National Guard units.

Shortfalls, retirements, fatigue

So, why was a newer Eagle purchased for the USAF? It was not just due to the small numbers of the Lockheed Martin F-22

Raptor that were purchased – the last of 187 being delivered in 2012 – but thanks to some high-profile fatigue-related incidents which led to the short-term grounding of the F-15 fleet. Basically, the fighter Eagle had gotten old and it wasn't just the Eagle either.

With many frontline aircraft such as the B-52, F-16, B-1, A-10 and F-15 having decades of hard service under their belts and with some newer machines having shorter production runs – like the F-22 – the USAF's combat fleet has been shrinking year-on-year for some time.

Figures shown in *Defense News* say that for 2025, 250 airframes will be retired from the USAF and only 91 new aircraft will be taken on charge. For 2026 it's looking like 340 machines will be retired and just 76 new ones will be accepted for service. Considering the threats facing the US around the globe, many feel that's not sustainable for much longer. This is especially true with the emergence China's burgeoning fleet of fourth, 4.5 and 5th generation aircraft in production and service and even 6th generation prototypes already flying. Therefore, something thoroughly modern yet proven and affordable enough to build in quantity was needed to fill the gaps – hence the 'new' Eagle.

When it came to airframes, many F-15s had – by the early part of the new millennium – led hard lives. Nevertheless, the USAF had enjoyed an excellent safety record with the F-15.

The first Eagle crash took place in 1975 and up to late 2014 just over 120 machines had been lost. While many incidents in

the early decades of use were the usual expected (but still unfortunate) ones of normal operational life such as mechanical issues, pilot error and air-to-air collisions during training, by the 2000s other issues were – naturally – surfacing with ageing aircraft.

On April 30, 2002, an F-15C from the 46th Test Wing out of Eglin AFB, Florida crashed, killing the pilot Major James Duricy. The Accident Investigation Board found that the crash was caused by the structural failure of the left-hand vertical fin during a high-speed manoeuvre.

More was to come at the end of 2007. On November 2, an F-15C of the Missouri Air National Guard crashed during ACM (air combat manoeuvring) training following a severe structural failure at 7.8G which saw the pilot – Major Stephen Stilwell – thrown around in the violently shaking F-15C at 18,000ft. Stilwell was forced to eject and suffered a dislocated left shoulder and a shattered left arm/elbow as a result of his escape from the aircraft at around 480 knots with parts of it hitting him during the ejection sequence.

Within 10 days around 1100 F-15s across the globe – both fighter and bomber versions – were grounded pending examinations. This severely hampered any Air Defence Operations over the US mainland. By November 15 the F-15E models were cleared to fly and by early January 2008 around 60% of the existing F-15A, B, C and D fleet were allowed to fly once more.

The issue was with a defect in a metal beam (called a 'longeron') in the ➤



The F-15EX is unveiled to press and public on April 7, 2021, and given the name 'Eagle II'.



The F-15EX features engines used on the advanced strike versions of the Eagle, along with a full, digital fly-by-wire system as well as advanced avionics.



Seen in April 2026, this F-15C based at Kadena, Japan has had a long, useful life. The final F-15Cs for the USAF were delivered back in 1985.



The F-15EX was based heavily on the advanced strike versions of the Eagle, which have been widely exported in recent years.



Spot the difference? F-15EX on left and Strike Eagle on the right.



F-15C and D Eagles had 'held the line' for decades.



Early renders of any proposed new build Eagle (and these 2040C single-seaters) would show a maximum 'beast' loadout of AAMs.



Under the 'Golden Eagle' programme, low-hour single-seaters would be updated.

1980-built F-15C that cracked and failed after 27 years and 5700 hours of hard use, causing it to break up during the high-G manoeuvres. This effectively sliced the F-15C in two, from the rear, right-hand side of the cockpit. Stilwell's horrified wingman's cockpit voice recorder caught him saying: *"Knock it off! Knock it off! Mick 2's airplane just broke in half! Eject!*

Eject! Eject! Mick 2: Eject! Eject!" Stilwell himself knew he had a serious problem on his hands: "Something very violent was happening to the airplane and it was something I had to get out of. That was a no-doubter: you just gotta get out of it!" With his career as both a 'weekend warrior' ANG pilot and his day job as a Southwest Airlines pilot ruined due to his injuries,

Stilwell actually sued Boeing in 2008 although the legal results of the case are shrouded in mystery.

The subsequent grounding found that as many as 163 F-15s had some issues with the longeron's design and a small handful – reportedly just nine airframes – were found to have some form of small crack in the component. Repairs were – at the time



An F-15 carrying the Talon HATE pod.

– estimated to be at around half a million dollars per aircraft affected. This reignited the debate on what to do with the F-15's replacement – the F-22.

Some would argue that the F-15 was past its sell-by date and that the only real answer was to procure more F-22s – at more than \$150 million per aircraft – or much more than three times that of an F-15. Despite many recent rumours that Raptor production could be restarted, the last F-22 was delivered to the USAF in 2012 and that – as they say – will be that.

Extending the Eagle

But what about keeping the older Eagles flying and relevant? An 'advanced' upgrade of the current F-15C/D fleet was called F-15 2040C – otherwise known as the 'Golden Eagle'. This would have seen the original single-seat and two-seat Eagle in service as a viable fighter until 2040.

Launched by Boeing in September 2015, the thinking behind this 'Advanced Eagle' was that it would act as a 'force-multiplier' alongside stealth fighters such as the F-22 and F-35 – just as the F-15EX Eagle II will today.

Similarly to the Eagle II, the upgraded F-15 2040C fighter would effectively become a 'missile truck' hauling large numbers of missiles into battle with the stealth fighters up ahead.

In both the F-22 Raptor and the F-35 Lightning, stealth is all-important: you don't want to hang anything on the wings if

you're taking on a hi-tech adversary. These aircraft have to use their internal weapons bays, meaning that the F-22 carries only six Advanced Medium Range Air-to-Air Missiles while the F-35 carries just four.

At the heart of the 'Golden Eagle' was the AN/APG-63(V)3 which was already being retrofitted into the USAF's F-15C and D model fighters. The V3 model, marries the proven APG-63 modules with the antenna and power supply from the Boeing Super Hornet's APG-79 AESA radar. This means that rather than a mechanically-scanned antenna (MSA) you have an active electronically-scanned (or steered) array (AESA) antenna that provides improved reliability and performance.

Some suggest this radar would have almost been as advanced as that seen on the F-22. The Golden Eagle's defensive suite of electronics would also have been improved with a Boeing/BAE Systems Eagle Passive Active Warning Survivability System (EPAWSS) which would replace the F-15C's AN/ALQ-135 Tactical Electronic Warfare Suite, bringing the defensive systems bang up to date. This side of the upgrade was announced in 2015, costing around \$4 billion and would have been rolled out not just on the F-15C/D fighters, but the F-15E Strike Eagles too.

With the new radar being retrofitted to the F-15C/D fighter fleet, the rest of the full 2040C package would take the potency

of the F-15 Eagle fighter still further. This would come in the form of the Talon HATE sensor and communications pod (no-one is quite sure where the catchy name comes from) which is effectively an airborne networking system which links the F-15Cs to other aircraft – including the F-22 Raptor – as well as surface units.

This system is a 'bridge' between 4th and 5th generation air assets and uses secure satellite datalinks to share the overall tactical picture between combat elements. As an added bonus, the front of the pod has an Infra-Red Search and Track (IRST) system at the forward tip of the 17ft long pod. During testing in 2017, many F-15s carried the 1800lb (818kg) pod on the centre hard-point – where the centreline tank would normally hang. This means some F-15s were seen using two 610 US-gallon (2310 litre) wing tanks instead.

So, what could it do? "This aerial network is a giant leap forward in tactical fighter capability with real-time connectivity and expanded information sharing," says Boeing's Talon HATE programme manager vice-president Paul Geery. "We are now demonstrating secure datalink connections between F-15Cs and F-22s in a way that integrates information for the pilot into a common operating picture."

Utilising the Talon HATE pod, updated Golden Eagles would have worked in concert with Raptors to identify and ➤

take down larger fleets of less stealthy foes. To kill such large numbers of enemy adversaries, the F-15 would carry 'quad pack hard-points' where the total number of AMRAAM missiles carried would be increased to 16.

The ideal scenario then would be the Raptors using their advanced sensors and stealth to identify and prioritise the targets ahead and then pass this information to the 'Advanced Eagles', with the information displayed on a new 'LAD' (Large Area Display) colour touchscreen in the cockpit. With increased range thanks to conformal fuel tanks (CFTs), they would then move forward and launch a phalanx of fire-and-forget AMRAAMs at their selected targets while the stealthy Raptors and perhaps F-35 Lightning IIs would then use their stealth and sensors to mop up whatever enemy aircraft were left.

This would be a great leap forward as previously Raptors could only 'talk' to other Raptors. The system has even been tested during the USAF's realistic training sorties. In one such exercise, four F-22s working in concert with four Talon HATE-equipped F-15Cs achieved a 41:1 kill ratio against simulated 'Red Air' forces: impressive results.

Ultimately, the Talon HATE pod was overtaken by events, and the capabilities have been taken on by the smaller Legion pod, but the tactics of use remain the same.

This inter-generational communication will become even more important, with the use of an ultra long-range missile by the

Eagle II. Recently, the USAF claimed to record its longest-range kill by AMRAAM, thought to be around 100 miles, but more is to come.

In recent years, the US has played catch-up to Europe, Russia and the Chinese in the development of long-range air-to-air missiles. However, with the introduction of the USAF's AIM-260 JATM (Joint Advanced Tactical Missile) with a brochure range of 120 miles and the US Navy's AIM-174B Gunslinger missile with a theoretical range of 150 miles plus that gap has disappeared!

Fuel for thought

One other large part of the Golden Eagle upgrade would be the use of conformal fuel tanks – these are part and parcel of the F-15EX Eagle II's design, as they were with the Strike Eagle, but it's interesting to look back at their development.

Extending the Eagle's reach is especially important since likely future conflicts may take place over the vast expanses of the Pacific – involving ranges in excess of 1000 miles. Also, the increasingly long-range missiles employed by potential adversaries (be they air-to-air or ground-to-air) make tankers and AWACS more vulnerable – preventing them from operating anywhere close to the front line.

Back in the day, a FAST-pack equipped F-15A, with around 13,000lb of fuel and three 610 US gallon tanks could have a ferry range of around 2700 nautical miles. In the late 1970s McDonnell Douglas

even claimed that the use of FAST packs improved the Eagle's subsonic aerodynamics. Initially, the FAST packs – first flown on an F-15 back in 1974 – were to house either fuel and/or other mission-specific avionics (including planned optical/infra-red sensors or a data-share system) but then they fell out of fashion.

Why? Well, back in the 1970s through to the 1990s, the USAF had plenty of tankers on station over the mainland USA and across the globe so the free flow of fuel was never an issue. Compare this to today where the USAF's KC-46 Pegasus is a late, but welcome addition to replace elderly KC-135E Stratotankers, which were worked hard during Operation Epic Fury over Iran, with the fleet suffering the loss of two aircraft and damage to up to six others.

While the three external 'drop' tanks that could be fitted on the F-15A through to D could be jettisoned should battle be joined, to regain the Eagle's agility, a FAST pack couldn't and there was an aerodynamic and weight penalty to be paid for fitting it. It was also rumoured that the FAST packs cost many man hours to attach and detach when it came to routine maintenance, even when it was claimed it would only take a few hours and the removal of a few bolts.

So, on the fighter version of the F-15 airframe, FAST packs fell out of favour. No infra-red targeting systems were developed (or at least fitted) to them, nor was the F-4E's TISEO (Target Identification System



An F-15 carrying the Legion pod.



The extra tanks seen on the F-15EX Eagle II's intake trunks. Derived from the FAST/CFTs of previous gen Eagles.

Electro-Optical) amalgamated into the pack either, as was originally considered.

This was ironic, as – during fights in the 1970s with aggressor aircraft – what became known as ‘Eagle Eye’ was being used. This was a simple x6 magnification rifle scope, used by Eagle pilots to get a visual identification on the smaller ‘Red Air’ aggressor F-5E Tigers they would fight against.

This was because it was hard for the likes of the F-14 or F-15 to ‘see’ an aggressor F-5 or A-4 Skyhawk until it was about 1.8 to 1.5 miles away, while the much larger Tomcat and Eagle could be seen up to 10 miles away. ‘Eagle Eye III’ was going to help this situation and be (like the F-4E’s TISEO) a wing-root mounted sight – or perhaps it could have been amalgamated into the FAST pack – but it never happened. Instead, the basic shape became simply an 849 US gallon CFT, which is seen predominantly on the Strike Eagle and its associated variants.

It has to be said that a few US-based F-15 fighter versions did see some use with the FAST/CFT packs back in the 1970s and 1980s – but only those based in the extreme north of the country, with the squadrons charged with defending the vast expanses of Alaska. There, the FAST/CFT packs were a useful addition. Israel also utilised the F-15 fighter version (even if used in the strike role) with CFTs.

Recently, a number of USAF and Air National Guard squadrons have started to use the CFTs to help boost their range, with the 159th Fighter Wing the ‘Bayou Militia’

taking part in a programme to monitor their effectiveness during day-to-day use.

Eventually, despite all the plans for ‘Golden Eagle/Eagle 2040C’ updates of the F-15 fighter fleet, it was decided that a ‘new-build’ Eagle would be the best option, albeit with some of the ideas moved forward to the new machine.

Under the skin of the Eagle II

The F-15EX Eagle II uses powerplants developed for a number of foreign Eagles: the GE F110-129. These power the F-15SG (Singapore) the F-15K ‘Slam’ Eagles of South Korea and the F-15SA of Saudi Arabia. The engines produce more than 17,000lb of thrust in ‘dry’ power and 29,500lb in full afterburner.

Back in the 1970s, ‘fly-by-wire’ was something that would come about with the F-16, hence that aircraft’s nickname of ‘The Electric Jet’ but FBW – where mechanical linkages are replaced with computers and electronic signals going to the actuators on the control surfaces – is now on the F-15EX and was debated on the advanced Saudi Eagle – the SA.

Another important element already seen on earlier, upgraded Strike Eagles was the radar suite: the AN/APG-82(V)1 AESA. This is now a proven ‘Active Electronically Scanned Array’ radar which takes multi-target tracking, detection and identification to a whole new level over the original F-15’s AN/APG-63 and AN/APG-70 radars.

Meanwhile, inside the cockpit it’s a world away from the old ‘steam’ gauges

seen in the legacy ‘Albino’ fighter F-15Cs and even from the newer F-15E Strike Eagles with their separate MFD (Multi-Function Displays). Like more modern 4.5 and fifth-generation fighters, both crew stations in the EX have a ‘LAD’ or Large Area Display some 10 x 19 inches as well as an Advanced Display Core Processor II (ADCP) computer controlling things.

While fifth-generation stealth aircraft rely on low observability and defensive electronic warfare and chaff/flare dispensers, for an aircraft like the F-15EX with a relatively large RCS, a low-workload automated defensive electronics warfare suite helps survivability in hostile airspace. Hence the AN/ALQ-250 Eagle Passive/Active Warning and Survivability System (EPAWSS) system.

Made by BAE Systems, EPAWSS is designed to help the next generation Eagles survive in a highly-contested hostile environment. Situational awareness for the pilot and back-seater (if carried) is key, so EPAWSS gives the crew a 360-degree picture of the battlespace they are in, rapidly updated as the system collects and processes electromagnetic energy and prioritises the threats around them. From there, the system can then take proactive measures to deny, degrade and disrupt those threats.

Not only is EPAWSS smaller and lighter than previous systems, it is effectively ‘5th-gen’ tech for a 4th or 4.5 platform. Its open system architecture means it is easily upgradeable to cover new threats or ➤



The Eagle II's cockpit is a world away from the original A and C models.



absorb new defensive systems, such as decoys – towed or otherwise. It works in conjunction with not just the F-15's AESA radar (without interference) but with the integrated AN/ALE-47 chaff and flare Countermeasure Dispenser System (CMDS) which has around 50% more chaff and flares onboard than older legacy Eagles.

A number of older 'Advanced Eagles' use BAE Systems' AN/AAR-57 CMWS (Common Missile Warning System) but the EPAWSS effectively covers that. The various 'lumps and bumps' on the airframe for the CMWS are retained on the EX – more than likely so as not to confuse the flight computers and FBW system.

Offensive might for the EX is impressive... The basic airframe is heavier and stronger than an F-15E Strike Eagle. The wing structure on the EX is redesigned, like that of the F-15QA, so the EX also benefits from a 20,000 hour service life. As a result, the EX can carry around 29,500lb (13,380 kilos) of external stores on 23 pylons, compared to a quoted 24,500lb (11,113 kilos) for the F-15E Strike Eagle. A

The Eagle II's various lumps and bumps all serve a purpose, be it aerodynamically or to do with the latest electronic warfare suite.



wide and variety mix of offensive/defensive loads can be carried while – on purely offensive missions – up to 22 air-to-air missiles on quad launchers could be carried in ‘murder’ mode... These can be off-boresight targeted either via the new, head-up display or with the Digital Joint Helmet Mounted Cueing System (D-JHMCS).

In addition to existing targeting/navigation pods such as LANTIRN (Low Altitude Navigation and Targeting Infrared for Night) and Sniper XR, the EX can also carry the Legion Pod, which houses an infrared sensor, the ASG-34(V)1 IRST21. Similar systems have been carried by other aircraft over the decades and this system allows for a degree of ‘passive detection’ where the F-15EX can search for enemy aircraft without alerting them by using the radar.

So, in a world of high-threat surface-to-air missiles and the proliferation of stealth fighters across the world, what can an almost 60-year-old design bring to the battlefield? Well, it’s the systems which are thoroughly modern and – when working in concert with 5th (and later) 6th-generation

aircraft – the likes of a 4.5+ capable machine with a big carrying capacity could tip the balance when a breakthrough into enemy airspace is made.

It’s thought that the stealthy aircraft could punch a hole in any enemy defences and then well-armed 4th and 5th-gen aircraft carrying external stores could swarm in. The need to remain stealthy, with internal weapons only means that combat persistence has long been an issue – this is not the case with the F-15EX.

Naming the new EX

There was only one name that could be considered for the USA’s newest fighter jet.

On April 7, 2021, Lt General Duke Richardson of the USAF presented the new F-15EX to press and public at the Eglin Air Force Base and christened the new machine ‘Eagle II’. He said: “Undefeated in aerial combat, the F-15 Eagle epitomised air superiority in the minds of our enemies, allies, and the American people for over 45 years, but it was not meant to fly forever. We heard the demand signal from our

war-fighters. I’m pleased to say we’ve responded boldly and decisively, with a proven platform that’s modernised and optimised to maintain air superiority now and into the future.”

While some critics may bemoan the lack of any stealth features, this wasn’t what the USAF wanted. Instead, the Eagle II offers a zero-hour airframe, powerful AESA radar and an up-to-the-minute defence suite (50% more chaff/flares than current Eagles and integrated radar warning and countermeasures to name just two) which gives the Eagle II greater survivability than any ‘legacy’ Eagle platform.

Boeing’s chief test pilot Matt Giese has flown F-16s, F-22 Raptors and all the advanced Eagles that were sold to air forces around the world; he says: “The three major advantages of the EX are the digital fly-by-wire system, those GE-F110 engines and the mission systems. The FBW system will allow the aircrew to fly the EX low and slow, high and fast at ease, safe in the knowledge that the flight control system will protect them.” ■

A USAF F-15E Strike Eagle heads off on another Epic Fury mission.



The Eagles of Epic Fury

After a long build-up of forces in the area, the USA and Israel launched a joint air attack on Iran. Once more, the F-15 was at the tip of the offensive spear for both nations.

On February 28, 2026, in a co-ordinated campaign, elements of the United States Air Force, United States Navy and United States Marines along with the Israeli Air and Space Force began hitting targets in Iran. For America, this was Operation Epic Fury; for the Israelis it was Operation Roaring Lion.

For weeks there had been a build-up of forces in the area. Land-based US aircraft, including the tankers vital for sustained operations, had shuttled through various bases on their way to the Middle East. Carrier air wings moved into the theatre and the world waited. Many experienced onlookers understood that, despite the talk of dialogue and discussion, such a large

force would not have been present unless it was going to be used – and so it was.

Less than a year earlier – during ‘The Twelve Day War’ between Israel and Iran – the US had staged a remarkable mission called ‘Midnight Hammer’. In it, just after midnight on Saturday, June 21, 2025, seven Northrop B-2 Spirit stealth bombers from the 509th Bomb Wing left their base



on an 18-hour trip to drop GBU-57/B Massive Ordnance Penetrators (MOP) bunker busters on a number of locations considered vital to Iran's nuclear weapons programme. At the same time, the US Navy launched 30 Tomahawk cruise missiles against additional targets.

In all, 125 aircraft were used in Midnight Hammer, including Lockheed Martin F-22 Raptors and F-35 Lightning IIs. Fourteen MOPs were dropped and after a 30-minute strike, the B-2s then had to fly back home. The total mission time was around 37 hours and around 52 tankers were used in support of the mission.

After the successful strike, President Donald Trump said: "Iran's key nuclear facilities have been completely and totally obliterated. Iran, the bully of the Middle East, must now make peace. If they do not, future attacks will be far greater and a lot easier. If peace does not come quickly, we will go after those other targets with precision, speed and skill."

The Eagles gather

Unlike Midnight Hammer, Operation Epic Fury would be a much longer mission,



Lakenheath's Eagles would be committed to Epic Fury.



Israel's powerful Ra'am Eagles would be at the frontline of Operation Roaring Lion.

lasting months. It would not be fought solely at night and by stealth aircraft; instead it would use all the various layers of tactical firepower along with their associated support aircraft that the US and its ally Israel could field.

It's thought that more than 300 aircraft from the US alone were committed to the operation. From Israel it's been confirmed that the venerable F-15D Baz was used in its strike format, alongside the F-15I Ra'am, F-16I Sufa and F-35I Adir stealth fighters as well as associated support aircraft.

The US contingent included the F-15E Strike Eagle, the F-16C block 40 and 52s, F-35As, F-22s, A-10C Warthogs, B-1B Lancers, B-52s, B-2 Spirit bombers as well as many support aircraft, including tankers, E-3G Sentry early-warning aircraft and RC-135V/W Rivet Joint ISR (Intelligence, Surveillance and Reconnaissance) assets and drones. On water, two Carrier Strike

Groups were on station with the USS *Abraham Lincoln* and the USS *Gerald Ford*. Each fielded a wide array of offensive and defensive firepower, including assets such as the F-35C, F/A-18E/F Super Hornet, EA-18G Growlers and E-2D Advanced Hawkeye for airborne early warning.

The F-15E Strike Eagles would come from the 48th Fighter Wing (The Liberty Wing) stationed at RAF Lakenheath and the 4th Fighter Wing from Seymour Johnson. Lakenheath Eagles would include machines from the 494th Fighter Squadron and the 492th. Seymour Johnson Eagles would come from the 335th and 336th Fighter Squadrons.

During the first 72 hours of Operation Epic Fury following from its launch at 1.15am on February 28, the Pentagon claimed that more than 1700 targets were struck in Iran. These included command and control centres, ballistic missile ➤



A Strike Eagle blasts off into the night on another mission.



Secretary of War Pete Hegseth and Joint Chief of Staff General Dan Caine address reporters on Operation Epic Fury.

sites, anti-ship missile sites, various Islamic Republican Guard Corps headquarters, Iranian naval assets and Iranian integrated defence systems as well as associated ground-to-air missiles sites.

The Lion roars

The mission objectives of Epic Fury and Roaring Lion may have been seen to shift from time-to-time, but *'regime change'* was often alongside *'remove Iran's potential nuclear aspirations'* as two of the main aims.

To this end, the Israeli Air and Space Force took the fight directly to Iran's leaders early on. It's reported that F-15D Baz two-seaters were the aircraft that helped destroy the compound where the Iranian Supreme Leader Ayatollah Ali Khamenei was located with his family on February 28. It was reported that he was killed in the attack along with his daughter, daughter-in-law, son-in-law and a grandchild. The attack also injured his son (and later successor) Mojtaba Khamenei.

In the *Jerusalem Post*, it was confirmed that F-15s were used in the strike on the compound in Tehran, but the weapons used were not mentioned. In the article, Chief Brigadier General 'R', who commands both F-15 and F-16 squadrons at Hatzertim Air Force Base, said of the overall strikes on the first day: "The initial operational success was fantastic – it meant that we stopped a lot of potential harm to our citizens." He added that it was the largest aerial assault in the nation's history, with more than 250 strike and support aircraft being utilised and said that the air force had – in partnership with the US achieved 'general air supremacy' over Iran within just 24 hours.

The weapon that is thought to have been used against the supreme leader's compound was either a Golden Horizon or a weapon from that family of missiles. The Golden Horizon is an air-launched ballistic missile (ALBM) and only a few countries have them in their arsenal, such as Israel, Russia, China and possibly India. Golden Horizon is thought to reach speeds of up to five times the speed of sound – making it hypersonic – and it has a range of anything between 650-1250 miles. This family of missiles is regularly seen being carried by the elderly – but still potent – Baz force.

On March 31 an Israeli Defence Force spokesperson said that 100 per cent of the 'critical' and 'essential' targets in Iran on the Israeli Air and Space Force's list had been destroyed.



Israeli air power is impressive: an F-35 Adir, an F-15I Ra'am, a two-seat Baz, and two F-16I Sufas.



The two-seater Baz variants have been used in attack missions almost since they entered service in the 1970s.



A shot showing a Baz carrying a version of Israel's indigenous air-launched ballistic missile.

Family feuds

The Middle East has been a hotbed of air combat for the last 70 years or more. And with the introduction of successive generations of McDonnell Douglas/Boeing fighters to a number of Middle Eastern nations, it has long been possible that a 'family-on-family' dogfight could happen.

The Iranian Air Force has operated the venerable McDonnell Douglas F-4 Phantom II in a number of variants since 1968 when the first D-models were introduced. This was followed by delivery of E and RF-4Es in the 1970s, making the post-revolution IRAF of the 1980s one of the biggest users of the type outside of the US.

With the purchase of advanced McDonnell Douglas F-15A/B, and C/D models by the likes of Israel and later Saudi Arabia in the 1970s-1980s and the tensions between the neighbouring states, it was only a matter of time before the old guard from St Louis would meet the new...

This happened on June 5, 1984, during the Iran/Iraq war when tensions in the Persian Gulf were high. With Saudi Arabia backing Saddam Hussein's regime, this made Saudi a target for the Iranians.

Two Iranian F-4Es were launched from Bushehr Air Base with the intent on hitting oil tankers during the so-called 'Tanker War'. However, the F-4s were tracked by US E-3-Sentry AWACs aircraft and the Saudis were informed and a pair of F-15Cs launched to counter the threat. At the time the F-15C was very new in Saudi service. The deliveries of the first 62 C/D model Eagles only began in January 1982 and ended in May 1983, filling three squadrons.

With guidance from the E-3, the two F-15C Eagles managed to engage the F-4Es above Arabi Island, shooting down one, flown by 1st Lt Homayoun Hekmati and his back-seater 1st Lt Seyed Sirous. Both crewmen died as a result. The

second Phantom was damaged, making an emergency diversion to Kish Airport. The aircraft was later written off. In response, the Iranians launched more F-4s but combat between them and the RSAF – who responded in kind launching more F-15s – was not rejoined.

Fast forward more than 40 years and the Eagle was once more involved in a 'family' shoot-down, this time it was Boeing product on Boeing product. But it's an incident which – at the time of writing – is still clouded in some controversy.

On March 1, 2026, during the early stages of Operation Epic Fury, three USAF F-15E Strike Eagles were destroyed over Kuwait in what seemed like a 'friendly fire' incident involving Kuwaiti Surface to Air (SAM) systems.

Initial reports suggested that it was down to a land-based MIM-104 Patriot missile system, that had been subject to many recent upgrades in Kuwaiti service. The Patriot missile features a 90-kilo warhead in PAC-2 MIM-104C/D/E versions and a smaller 8.2 kilo warhead in the later PAC-3 MIM-104F version. This later version uses the kinetics of the missile rather than a big warhead to destroy the target. Kuwait is thought to operate both versions.

Some former US pilots however, opined online that the Patriot in either model variant would simply have destroyed the F-15Es thanks to either the size of the warhead or the kinetics involved and yet videos were shown of the Eagles falling from the sky, with damage to the rear-most part of the aircraft – possibly denoting an IR/heat-seeking missile with a smaller warhead. Thankfully, all six crew members ejected safely, one suffering a severe hand injury.

The internet was soon going into overdrive. YouTubers began using the popular DCS flight simulation software to try and replicate the incident. Some of these run-throughs agreed with what experts were saying. It was considered that a Patriot hit would result in very little time for the crew to even eject from their Strike Eagles and that these could completely destroy the aircraft. Even before the dust



One of the Strike Eagles crashing to the ground.

had settled, it was thought that – perhaps – the 'friendly fire' was from above the ground.

By March 3, the *Wall Street Journal's* Lara Seligman had broken a story claiming that the three Strike Eagles were shot down by a Kuwaiti Air Force F/A-18 Hornet – a legacy model, 39 of which were purchased in the early 1990s, to replace the McDonnell Douglas A-4KU Skyhawks previously in service. Next-generation Hornets have been ordered (28 E/F model Super Hornets) alongside Eurofighter Typhoons, but it's thought that the earlier Hornet shot down the F-15Es on March 1.

Seligman's story came from three sources that she said were *'familiar with initial reports of the incident'*. It was reported that one Hornet had shot down all three Strike Eagles.

Perhaps it was an AMRAAM shot, or similar? But then these would alert themselves to the Strike Eagle crews. But a heat-seeking AIM-9 wouldn't – unless cued by the Hornet's AN/APG-65 radar – and the smaller warheads in the Sidewinders and the fact that the Eagles seemed to be hit at the rear – where the engines are – pointed towards the AIM-9 or similar as the weapon that downed the F-15Es.

A video was released that showed the aircrew on the ground: one being greeted by Kuwaitis and one being mistaken for an Iranian crew member. Still later came uncorroborated footage of what does seem to be a legacy Hornet shooting down an F-15 from quite close range, complete with the trademark 'plume' spiralling from the launched AIM-9.

A number of former US pilots questioned how the Kuwaiti pilot could have mistaken the Eagles for anything else, or that, how could the hi-tech IFF (Identification Friend of Foe) equipment not show that the Eagles were 'friendly'. Others said that 'the fog of war' at the time included the fact that a large number of drones were entering Kuwaiti airspace could have led to a high workload in the single-seat F/A-18C cockpit, or that any drones in the area would have a lower heat signature to the exhaust plumes of the Pratt & Whitney F100s. And – when it came to visual identification at even short ranges – pilots who flew over Kuwait and the gulf could attest to the hazy conditions, even in a cloudless sky. Other, more fanciful, explanations centred around a pilot who held a personal grudge against the Americans...

At the time of writing an uneasy ceasefire was in place between the US/Israel and Iran and doubtless investigations are still ongoing as to the incident between the US and Kuwait.

Qatari shootdowns

A day later, on the morning of March 2, and the F-15 family redressed the balance somewhat and added two more kills to its credit – even if the aircraft involved were 'Advanced Eagles' from the Qatar Emiri Air Force (QEAF) rather than older, legacy Eagles from the USAF or Israel.

Qatar's Ministry of Defence revealed that two unidentified aircraft were spotted on radar heading towards Al Udeid Air Base, used by US forces, and Ras Laffan – a liquified natural gas complex. These two locations were thought to be the targets for the two aircraft, later identified as Sukhoi



One of Kuwait's two-seat F/A-18D Hornets.



Iran still had more than 20 Su-24 Fencers in service by early 2026.

Su-24 Fencer swing-wing attack aircraft of Soviet vintage of which more than 20 updated MK-models were still in Iranian service at the start of 2026.

At one point, the Fencers dipped as low as 80ft to try and avoid radar and sources claimed that both were armed with bombs and guided munitions. With warnings ignored by the incoming aircraft and the intruders just two minutes away from one of their targets, two Qatari fighters engaged

them. Those fighters were F-15QA Ababils – more than a match for the Fencers. It's not yet been revealed what weapons were fired, but it's thought they were AMRAAMs.

It was interesting in so much as Iran's retaliation to the Epic Fury attacks have (at the time of writing) been solely left to drones and ballistic missiles, rather than any air force units, which had been eroded since 2025's 'Twelve Day War' and now Epic Fury/Roaring Lion.

“WE GOT HIM!”

The United States armed forces have – for decades – been proud of the fact that they do their utmost to not leave anyone behind in the combat zone...

Formed in 1946, as the 'Air Rescue Service', the United States Air Force Combat Rescue School's escapades are the stuff of legend. And the knowledge that someone will try and come and rescue them is reassuring to any combat



US air and ground forces train extensively in the CSAR role.



Wreckage of the aircraft showed it was that of an F-15E Strike Eagle.



aircrew that is going into action. In the Korean War almost 1000 aircrew were rescued and in the Vietnam War 2780. The organisation's motto is therefore fitting: *'That Others may Live.'*

On April 3 an F-15E Strike Eagle was the first aircraft shot down inside Iran since the start of hostilities on February 28, despite the US administration claiming that they had complete air superiority over the country. While the pilot was rescued some seven hours later, the Weapons Systems Officer (WSO), a colonel, call-sign 'Dude 44', had to evade enemy forces and hide in the Zagros Mountains, near to where he had ejected.

The Iranians were initially claiming to have shot down an F-35 Lightning II, but it was clear from some of the footage that – if accurate – the aircraft was an F-15E Strike Eagle from the 494th Fighter Squadron.

It was now a race against time for the US CSAR (Combat Search and Rescue) team to find the downed and possibly wounded Whizzo.

Firstly, how could an F-15E – seemingly roving with impunity – be shot down when the US had claimed total air superiority? It's thought that – while the Iranian's fixed surface-to-air missile sites and associated radars had been drastically eroded – that the Eagle was hit by some form of shoulder-launched MANPAD (Man-Portable Air-Defence Systems).

As the story unfolded, both the US and the Iranians had already started to act. For the US it was to put together a rescue mission which included hundreds of troops and special forces and around 155 aircraft, including helicopters, A-10C 'Sandy' aircraft, which protect the helicopters and the Lockheed MC-130J Commando II aircraft. An up-to-date variant of the venerable Hercules transport; this version is specifically for infiltration and extraction of special forces as well as being able to transport heavy loads and act as a refuelling aircraft.

During the search for Dude 44, the

Iranians had already released grainy video of two MC-130s and UH-60 Blackhawks, presumably over the site where the F-15E Strike Eagle had gone down. Later footage released during the race to find Dude 44, purported to show the shoot-down of one of the A-10C Warthog support aircraft between the Qeshm and Hengam Islands. The US confirmed that the 'Sandy' aircraft was damaged but that the aircraft was able to reach a friendly area before the pilot ejected safely.

Iranian officials had issued strict orders for the downed airman to be taken alive, and they offered a \$60,000 reward for his capture. This meant that not only were the IRGC involved in the search, but any local tribesmen who knew the area well. For the Iranians the possibility of parading a downed airman on state television would have been as big a coup for them as it would be a major blow for America...

Meanwhile, Dude 44 was leaning heavily into his SERE (Survival, Evasion,

Resistance and Escape) training. At night, he began to move some 7000ft up into the Zagros Mountains and reportedly took shelter in a crevice. He only used his emergency beacon from time to time so the Iranians wouldn't be able to pinpoint his location.

Aircrew generally carry some form of survival radio – perhaps an AN/PRC-112 as well as a GPS beacon or a strobe for detection by friendly aircraft as well as other forms of kit to signal over-flying friendly aircraft. Dude 44 would be equipped with a sidearm of some sort, fresh water, purification tablets and emergency food rations to last up to a week. Basic First Aid supplies would also be carried – and it was later reported that Dude 44 had been injured, possibly during the ejection sequence itself.

In the background the CIA were apparently launching a disinformation campaign in Iran, which said that Dude 44 was already safely recovered. Meanwhile, those sporadic beacon signals from his location had been confirmed as his. A short radio message from Dude 44 simply said: "God is good." The US now swung into full rescue mode to get him home...

A temporary airstrip was used as a forward operating location or FARP (Forward Arming and Refuelling Point). This was in southern Isfahan about 15 miles north of Shahreza city. The MC-130Js landed on the abandoned airstrip (which was just 200ft by 4000ft) and the area was immediately protected by a cordon of Delta Force personnel. Meanwhile the US Navy's Special Warfare Development Group (DEVGRU) otherwise known as SEAL Team 6 special forces prepared to make the rescue with the four A/MH-6 'Little Birds' from the 160th Special Operations Aviation Regiment (SOAR) which were removed from the back of the Hercules aircraft and assembled in minutes for immediate use.

During the rescue both US and Israeli aircraft were on hand to provide air support



Iranian sources showed the wreckage left of the MC-130s and the 'Little Birds.'

and during the daylight rescue of Dude 44, the US ground forces kept the Iranians away from the rescue area. Scarily, the US personnel were without an extraction option for around two hours, when it was found that the MC-130Js had sunk into the sand and could not take-off. Thankfully, it was reported that American Airbus C295Ws assigned to the special forces role could come in and extract the whole US force. This meant that the two Hercules and Little Birds had to be destroyed on the ground.

On April 5, it was announced that Dude 44 had now been successfully rescued. In a post on Truth Social, President Trump said: "WE GOT HIM! My fellow Americans, over the past several hours, the United States Military pulled off one of the most daring Search and Rescue Operations in U.S. History, for one of our incredible Crew Member Officers, who also happens to be a highly respected Colonel, and who I am thrilled to let you know is now SAFE and SOUND!"

The rescue of Dude 44 was an incredible operation, which the US understandably saw as a victory – despite the losses in war materiel. They had extracted the WSO for the loss of two MC-130Js, one A-10C and four A/MH-6s. Wounded were the two F-15E crew and some aboard a UH-60 used in the pick-up of the pilot.

On the flip side of all this were rumours that – far from being some sort of rescue mission – instead this was a special forces operation to find and extract nuclear material from Iran.

Some pointed to the location of the mission – near Isfahan and its nuclear facility while others asked why Dude 44

– a colonel no less – was in the air during a regular strike mission. Was he instead helping co-ordinate a larger 'snatch and grab' mission on Iran's nuclear storage facilities? And why no interviews of Dude 44 post-rescue, to confirm the whole story?

And finally...

Some news outlets not familiar with military aviation have mused as to why the latest F-15EX Eagle IIs weren't used over Iran.

With only 27 delivered by April 2026 and with the aircraft still being developed for USAF/ANG 'homeland defence' service in the air-combat role, it's the wrong Eagle for the mission over Iran.

Instead, it does show that some of the Eagle II's systems – such as the integrated EPAWSS electronic warfare system (see previous chapter) are vital for the older F-15E for survival in even mildly contested airspace. Around 100 Strike Eagles will get the system and other new developments have already been seen on Strike Eagles, taking part in Epic Fury, including a Controlled Reception Pattern Antenna (CRPA) which is part of the Digital GPS Anti-jam Receiver (DIGAR).

This was installed by BAE Systems in 2022 and uses multiple antennas to withstand jamming of on-board satellite navigation systems used on the Strike Eagle as well as ensuring more accurate positioning thanks to improved GPS signal reception. Advanced communication devices are also on the horizon for the F-15E.

The attack versions of the F-15 in both US and Israeli service have garnered more than their fair share of column inches during the short Iran campaign.

It's beyond the scope of this publication to go into the politics and the legitimacy of the Iran War, suffice to say that (as this is being written) it's thought that in total around 9000 people have been killed and 44,000 injured across the whole theatre of conflict. This includes many civilians – at least 1700 in Iran alone.

In March, the Red Crescent claimed that US and Israeli forces were targeting residential areas, industry as well as medical centres and schools. On the first day of the conflict, 156 people were killed in what seemed to be a Tomahawk strike on the Minab School. One hundred and twenty children were killed (73 boys, 47 girls) and 26 teachers alongside a number of parents, the school bus driver and a number of others.

And, of course, there is Iran's response to such attacks, which ranges from targeting US forces in the region as well as sporadic attacks on a number of Gulf states, killing indiscriminately and surely alienating Iran still further.

At the time of writing, it's thought around 44 service personnel have been killed by Iranian missiles, drones and bombs, including 15 Israeli soldiers, 14 US personnel (one non-combat related) as well as four from Qatar, three from France, three from Indonesia (officially listed as peacekeepers) two from Kuwait, two from the UAE and one from Turkey.

The Strike Eagle shoot-downs, the accuracy and intel behind some of the air attacks and general politics aside, Epic Fury and Roaring Lion have shown that the F-15 is still the go-to attack platform for both nations as well as a still-lethal air defence and superiority fighter. ■



Whatever happens in any conflict in the next decade or so, the Strike Eagle will still be at the cutting edge.

While issues have affected deliveries of the new Eagle II, the aircraft is proving very popular in service.



The Eagle today and tomorrow

Predicting the future is a tricky business and predicting the procurement process of any military air force is trickier still, but how are things looking for the future of the F-15 in a world of 5th and now 6th generation fighters?



On Friday, March 21, 2025, it was announced by President Donald Trump in the White House's Oval Office that the winner of the contract for the United States Air Force's next fighter aircraft was Boeing – current manufacturer of the F-15EX Eagle II.

Called the F-47, the 'Next Generation Air Dominance' fighter or NGAD for short, this would eventually replace the current F-22 Raptor and eventually (presumably) a number of other aircraft in current and future USAF service including future deliveries of the F-15EX Eagle II.

Following on from the rising costs of previous cutting-edge military aircraft, such as the F-22 and F-35, it's hoped that the F-47 will cost less than the current F-22, according to Air Force Chief of Staff Gen. David Allvin. He added: "And be more adaptable to future threats. The Air Force will have more NGAD fighters in its fleet than Raptors."

The USAF/ANG now has about 185 F-22s, which cost around \$150 million each. At the time of writing the 2027 Defense Budget announcement shows that a further \$5 billion will go into the development of the F-47 on top of the \$3.4 billion that was set aside for fiscal year 2026. It's thought that the total expenditure on the F-47 NGAD between 2025 and 2029 will be around \$20 billion in total.

For the F-15EX Eagle II, 21 aircraft are planned to be bought at a cost of around \$3.1 billion in 2026 and in 2027 a planned procurement of 24 aircraft is ➤



The next Boeing fighter: the F-47.

proposed. As always, the overall planned procurement totals have fluctuated. In 2025 it was planned that the EX Eagle II fleet would be growing from 98 aircraft to 129 after being cut back from an original number of 144. It was revealed in April 2026 that the total number on order would more than double, to 267.

Operators and issues

Problems have dogged the manufacture of the F-15EX. Early on in the procurement

process, production issues led to a reported six-month delay in delivery of some airframes. Meanwhile a 105-day strike by Boeing workers between August and November 2025 hit delivery of aircraft to the USAF and led to a rescheduling of deployment to Kadena Air Force Base in Japan.

Following on from the Eglin test aircraft, the first unit to accept the Eagle II was the 142nd Wing at Portland Air National Guard Base in Oregon. Current,

operators and planned operators of the new Eagle include New Orleans Air National Guard, Oregon ANG, California ANG and the 18th Wing at Kadena AFB, Okinawa.

Platinum Eagles and old Mud Hens

At the time of writing there are less than 200 F-15C/Ds in the inventory and around 220 F-15E Strike Eagles.

For some time now the vitally important home defence of the United States as well as other areas around the globe has been held largely by a force of F-15C/D Eagles, F-22 Raptors and (previously) the likes of the F-16 ADF.

With the Raptor purchase curtailed to fewer than 200 examples and the F-16 ADF retired in USAF service in 2007, it was clear that – despite their age and issues – some of the pure fighter F-15s may have to stay in service.

The original plans for the ‘Golden Eagles’ (see Chapter 8) may now become the ‘Platinum Eagles’. A report from August 2025, the ‘Long-Term Fighter Force Structure’, suggests that – rather than retirement – a force of single and twin-seat ‘Albino’ fighter F-15Cs and Ds could be retained in the important air defence role through 2026 to 2030, giving a useful period for the introduction of the F-15EX Eagle II.

It’s thought that around 40 or so F-15Cs and Ds would be earmarked for this, with numbers dwindling year-on-year before the full retirement of the original fighter-optimised F-15 in 2030 – some 54 years after service entry. As with any airframe



Oregon Air National Guard Majors, Calvin ‘Knife’ Conner and Brandon ‘Wiggles’ Wigton, assigned to the 142nd Wing, 123rd Fighter Squadron, in Portland, Oregon, prepare for take-off with the newest F-15EX in Missouri June 2024.



An F-15EX Eagle II arrives at Kadena for a familiarisation visit to the base in July 2025.



An A-10C Warthog and an Eagle II side-by-side. The F-15EX is slated to replace the Hogs of the Selfridge ANG in 2028-2029.



It's suggested that a small force of updated single and two-seat C and D models be kept until 2030.

that is close to the end of its service life, there would be some limitations as to how many hours and what G-loading they would be given.

So, what of the air-to-ground Strike Eagle? With service entry back in 1989, they've served with distinction in most conflicts of the last 30 years.

Well, in a similar vein to the USAF's new-build EX Eagle IIs benefiting from the

design direction of the previous 'Advanced Eagle' models, so the cream of the crop of existing F-15E Strike Eagles can benefit too.

Retrofitting a number of features to existing lower-hour airframes makes sense – and it's already happening. The new AN/APG-82 AESA radar has been retrofitted to a number of Strike Eagles; meanwhile other defensive aids have been added and The Liberty Wing based at Royal Air Force

Lakenheath in the UK received the first of these updated F-15E Strike Eagles in January 2025.

These first two redeliveries featured the Eagle Passive/Active Warning and Survivability System, (EPAWSS). One aircraft was assigned to the 494th Fighter Squadron and the other to the 492nd FS so that both squadrons can get 'hands on' with the new defensive suites. ➤



The advanced EPAWSS system will go onto a number of updated Strike Eagle airframes.

On delivery, Lt Col Timothy Causey, 494th FS commander said: "Having EPAWSS operational at RAF Lakenheath significantly enhances our ability to detect and counter threats, ensuring the safety and effectiveness of our crews. This advanced electronic warfare system, when combined with the F-35s, acts as a powerful force multiplier, transforming our operations and amplifying the 48th Fighter

Wing's impact in the battlespace." Little wonder that Lakenheath's Strike Eagles were used in Operation Epic Fury.

Export enhancements

In the Far East, Japan's fleet of F-15 Eagles is the largest outside of the USA with 223 built, the majority being assembled under licence by Mitsubishi Heavy Industries. The F-15J and DJ are – similarly to the

Israeli Air Force Baz fleet – both ageing (the first Mitsubishi-built Eagle first flew in 1980) and still a prized asset.

The JASDF (Japan Air Self-Defence Force) has seen the Eagle subject to a rolling upgrade over the years with various indigenous systems and weapons – including the AAM-3 short-range missile.

In the last 15 or so years a number of upgrades have found their way onto the Eagle fleet, including more powerful computers, upgrades to the licence-built F100 engines, new ejection seats and the Raytheon AN/APG-63 (V)1 radar which will be married to the Japanese-designed AAM-4 – which is broadly equivalent to the AMRAAM. The replacement for the AAM-3, the AAM-5 – a close-in dogfight short-range missile has also been successfully married to a modern helmet sight system.

It's also been suggested that the JASDF would like to see the carrying capacity of its F-15Js updated from eight to 16 missiles. In fact, it could be that the Japanese embark on a major update to the Eagles which could even include re-winging a certain number of the fleet.

The pressures in the region include China being somewhat more boisterous than in the past, with both naval and air forces often being engaged by F-15Js and the indigenous Mitsubishi F-2 fighter-bombers. It was no secret that Japan wanted to buy the F-22 Raptor but was



Lakenheath's 'Liberty Wing' Strike Eagles took part in Epic Fury.



Japan has a large fleet of gen-one Eagles.



Israel's F-15s have been at the tip of the combat spear, even with the introduction of the F-35 Adir.

frustrated by the US's ban on the export sale of the type. While delivery of F-35s is going ahead, Japan is also looking at the development of a future 5th-6th generation 'stealth' fighter.

Despite developing the F-2 alongside Lockheed-Martin (it's an upscaled F-16) in December 2023 Japan formalised a treaty to join the UK-Italian Tempest or 'GCAP' (Global Combat Air Programme.) This effectively melds the Japanese F-X programme with the new GCAP development. The in-service date is currently 2035.

The Israel Air-Defence Air Force was the first foreign air arm to choose the F-15 and the first to take it into combat. IAF Eagle variants have been in almost constant combat ever since.

They've relied on the abilities of the F-15 Eagle since 1976 when the first F-15A and B models were delivered. Although latterly they have bought the multirole versions of the Boeing fighter, they still

have large numbers of the original F-15 fighter variant in service and keeping these machines relevant and up to date has been a priority for the force.

Long before the development of the F-15E Strike Eagle, the two-seater F-15B/D Baz in Israeli service has been a capable strike aircraft while the single-seaters have reigned supreme in the fighter role. Even with successive upgrades on individual aircraft it was clear to the IAF by the mid-1990s that a fleet-wide series of updates would be the best option.

'Baz 2000' was the name of the programme which ran from 1995 to 2005 and saw many improvements made to aircraft and 8000 hours were spent on each aircraft bringing them up to date. The changes were heavily based on the USAF's Multi-Stage Improvement Program, but crucially it also included some upgrades which had come on-stream with the introduction of the F-15I Ra'am.

Most importantly was the introduction

of a common cockpit configuration, new multi-function displays in both cockpits (in the case of the D-models) including updated 'HOTAS' (Hands On Throttle And Stick) controls as well as the upgrade to the radar so the Baz could fire the latest versions of the AIM-120 missile as well as be integrated with the latest Israeli short-range missiles, such as the Python 4, off-boresight dogfight missile and an Elbit helmet mounted sight.

A new electronic warfare system was installed along with more modern computers and the latest GPS navigation systems. Perhaps the biggest job was the complete rewiring of all the Eagles chosen for the upgrade.

Even with the order of F-15Is in the 1990s, as recently as 2016 the IAF has been eagerly adding to its stocks of the original fighter version of the F-15. Nine ex-Air National Guard two-seat F-15Ds were donated by the US government and – despite some being first flown back in the late 1970s – they were also refreshed and reconfigured with Israeli electronics and sub-systems to be brought into line with other Baz jets in the IAF's inventory. These two-seaters are prized assets, handling a number of important missions including reconnaissance and strike missions. These old airframes were subjected to a full 170-day upgrade, in effect making them almost 'as new'.

In Israeli service the modified Baz fleet should be in use for another couple of decades and with their history of acquiring older Eagles and updating them locally, it could be that some USAF Eagles may end up in Israeli hands.

These would join the 25 ordered (and 25 optional orders) of the F-15IA (Israel Advanced). Based on the EX Eagle II, the deal is worth anything up to \$8 billion and deliveries are scheduled to start in 2031.

The new fighters would complement and, in some cases, replace older Baz and Ra'am airframes and doubtless be equipped with many indigenous Israeli systems.

'Silent Eagle'

The F-15EX Eagle II, an advanced derivative of the original Eagle is now in service, but Boeing has tried before to land a lucrative deal with a number of advanced F-15 derivatives.

There were plans to produce a newer/updated version of the F-15 fighter airframe adopting some 5th generation capabilities and one was called 'Silent Eagle'.

In early 2009, Boeing put on display its F-15SE demonstrator which amalgamated certain elements of a 5th generation fighter into the proven Eagle airframe. This was to be a multirole Eagle, but one with all the abilities of the fighter versions then in service but with some big improvements.

Reducing the 'radar cross section' (RCS) of the Eagle was the number one factor in the Silent Eagle's tweaked design. To this end, Boeing found that canting out those huge twin vertical tails by 15 degrees helped reduce the F-15's



A Boeing render of how the new F-15IA could look in Israeli service.

RCS. Other technology, such as the use of radar-absorbing materials (RAM) as used in 5th generation fighters and four conformal weapons bays (CWB), which would be in the same location as the conformal fuel tanks, would reduce the big fighter's radar signature still further. For 'non stealthy' missions, weapons could still be hung from

the various wing and fuselage hard-points.

Under the skin other advances included a full fly-by-wire system, the Raytheon APG-82 AESA (Active Electronically Scanned Array) radar as well as an up-to-the-minute electronic warfare suite packaged in the main airframe. The aircraft would also field advanced targeting pods, including an

infra-red search and track system. Overall, it was considered that such new-build Silent Eagles – possibly taking advantage of the latest variants of both the Pratt & Whitney F100 and General Electric F110 – would have improved performance, most notably in longer range, thanks to the aircraft being lighter and more fuel efficient.



Silent Eagle used the basic F-15E airframe and used a number of internal weapons bays.



Silent Eagle also used outward-canted fins, in the style of those seen on the likes of the stealthy F-22 and F-35.

The result was an F-15 that – compared to the original machine – could (and let's stress the 'could' here) have an RCS one fifth, or less than one fifth of the original F-15 Eagle. This is of course dependent on the aspect of the airframe to the radar that is looking at it: impressive, but not in the same league of a 5th generation fighter with stealth 'built-in' to the aircraft's blueprints. It's also worth noting here that thanks to political pressures, the aim was to be 'stealthy' only against air-to-air threats – not to more advanced ground radars, should these 'Silent Eagles' be sold abroad.

Despite possible customers at home and abroad (Israel, Japan and Saudi Arabia especially could have benefitted from a 'stealthy' Eagle on charge) no orders were

forthcoming. This was even though the conformal weapons bay was tested with a live firing from an F-15E demonstrator in 2010 which also trialled various RAM coatings and paint finishes.

The flyaway cost of the SE was thought to have approached \$100 million dollars per aircraft, including spares and support which compares to \$150 million for an F-22. Some aspect of the Silent Eagle programme found their way into export F-15E variants, notably some of the RCS reduction material and some of the electronic warfare equipment which found its way onto South Korea's F-15 Strike Eagle fleet. South Korea was also partnered with Boeing on the manufacture of the CWBs should the Silent Eagle find orders.

Other exciting tech developed on the Silent Eagle was a next-generation helmet display/targeting system. The Joint Helmet Mounted Cueing System was integrated on the Silent Eagle trials aircraft (an F-15E devoid of the canted-out twin-tails). This allowed the F-15SE's weapons to be aimed where the pilot was looking. A refinement of what had been developed previously by Vision Systems International, this latest version was ergonomically superior, lighter and more reliable than previous systems.

Eventually, despite initial interest from Israel, Saudi Arabia, Japan and South Korea no firm order materialised. Today, with the EX Eagle II in production and with Boeing inline for producing the 6th generation F-47, don't expect the Silent Eagle to make any phoenix-like rebirth any time soon...

Future orders and 'the final word!'

Looking ahead, the future is still very bright for the F-15 family. With ongoing upgrades for Eagles (in some cases) more than 40 years old and with the next generation in full production, it could be that more export orders are forthcoming.

Since the Eagle's first flight in 1972, more than 1700 have soared skywards, carving out an unrivalled record in air-to-air engagements, as well as becoming arguably the most advanced ground-attack/interdictor of its generation.

Looking back at the F-15's five decades in service, it's the ultimate irony that a machine designed and built as a dedicated fighter and air-superiority platform should now see continued sales success with the multirole strike versions and advanced derivatives.

But, even with the introduction over the last two decades of genuine ➤



A Boeing render showing the Silent Eagle in action.



This shot from April 2026 shows the power and agility of the latest F-15EX Eagle II.

5th generation fighters and combat aircraft (Lockheed's F-22, F-35 and examples from both Russia and China in or nearing service), many air forces will be priced out of the 5th generation game and will look instead to proven designs perhaps packaged with improved technology. These are aircraft such as the Dassault Rafale, Eurofighter Typhoon and Saab Gripen as well as the Lockheed F-16V, advanced Boeing Super Hornet derivatives and now, the latest F-15EX Eagle II.

So, while the F-15EX Eagle II may have recently lost out in production orders to the likes of Germany, Thailand and Indonesia, other opportunities still remain – most notably Poland and perhaps Egypt. Only time will tell.

Perhaps the last word should be left to Irving 'Irv' Burrows, the first pilot to take an F-15 Eagle aloft and who watched with interest the recent first flight of the F-15EX Eagle II back in 2021. He said: "A little over two years after first flight and after some 3000 test flights on several test airplanes the first operational F-15 was delivered to the Air Force. Since that time the Eagle has undergone continuous improvement and testing. The most recent models, though they appear much the same as the F-15A we first flew, are more than 30 years newer in technology, have vastly increased capability and carry a two-man crew rather than a single pilot.

"The weapons systems operator is in the back seat and current technology allows the airplane to fight in both the air-to-air and air-to-ground battles in all kinds of weather. Until the next generation of fighter-bomber is available, the Eagle remains the Air Force's 'weapon of choice!'"

Ultimately, for McDonnell Douglas/ Boeing's F-15 Eagle to be in production and 'still in the fight' almost 55 years after the machine's first flight is an amazing testament to the strength of the original design. ■



The sun has yet to set on the F-15 Eagle story...

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histories, or reviewing restoration efforts, the magazine honours the crews and the machines that shaped aerial warfare over the decades. Every 88-page issue includes a gatefold eight-page cover with poster artwork suitable for framing.

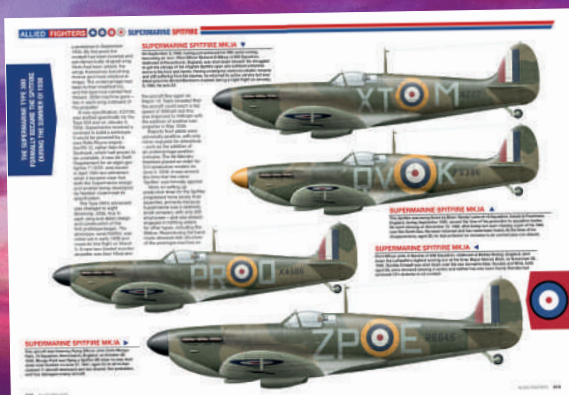
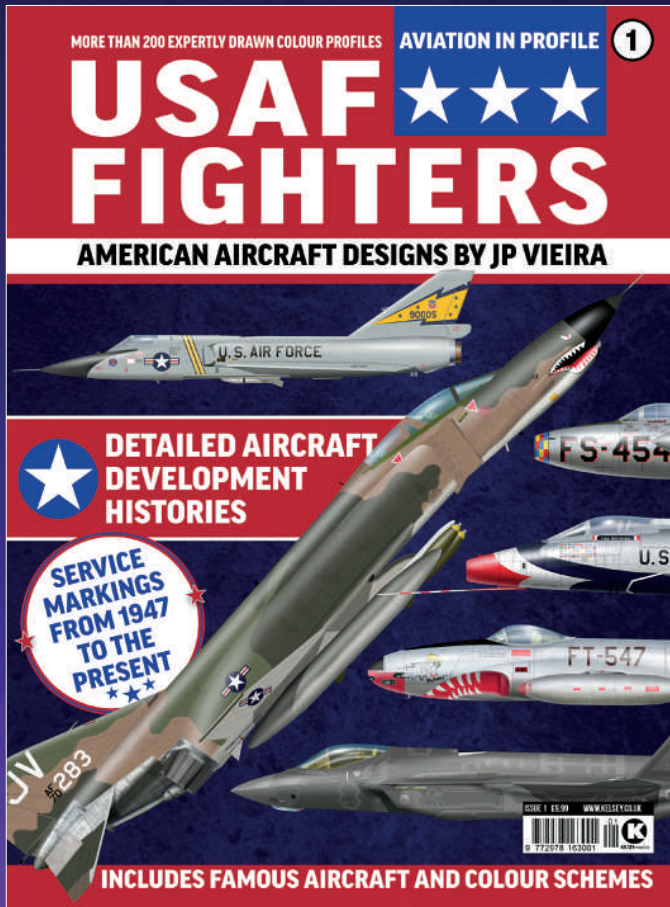
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World War II Air Combat bookazine series

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Air Power and Classic Warplanes



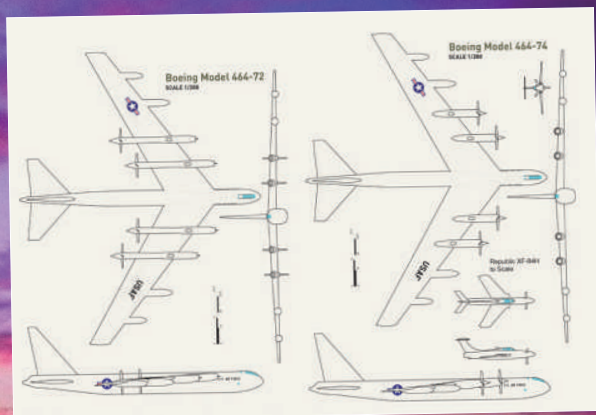
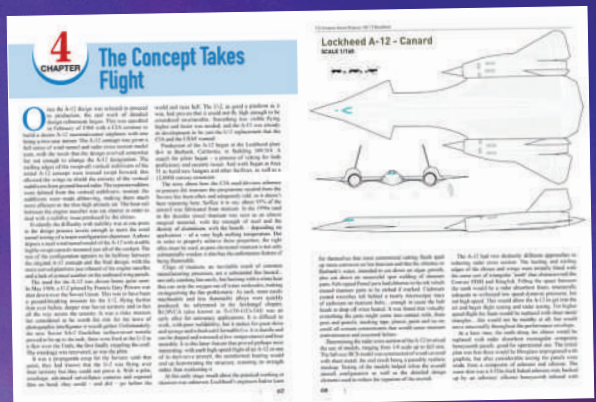
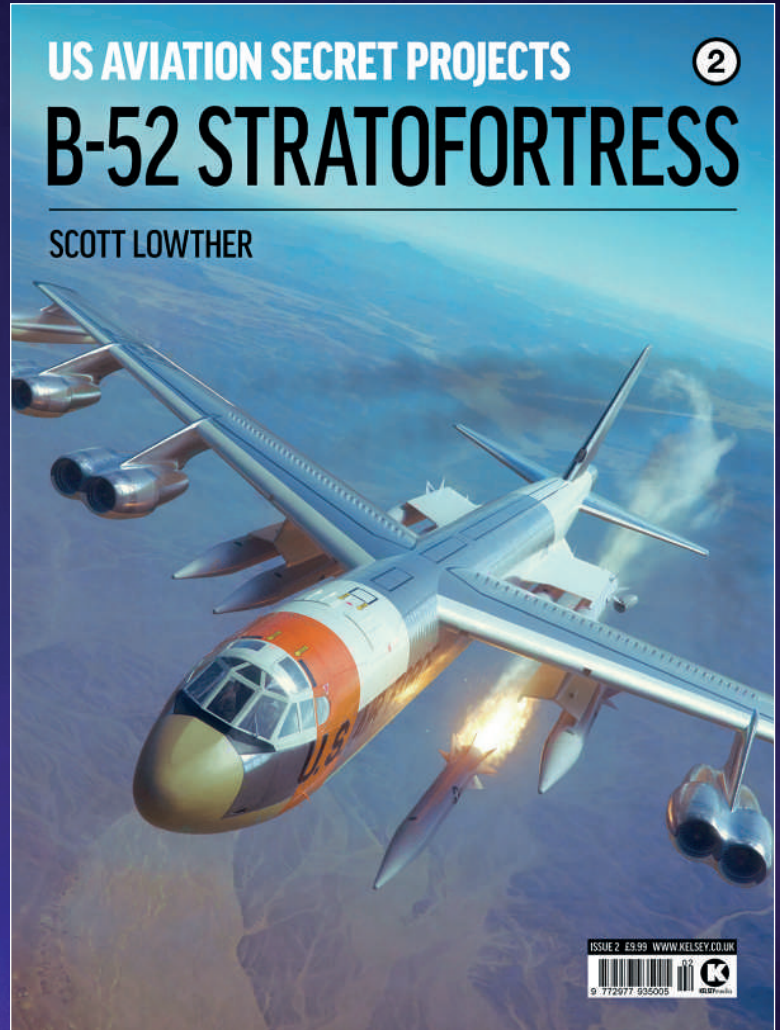
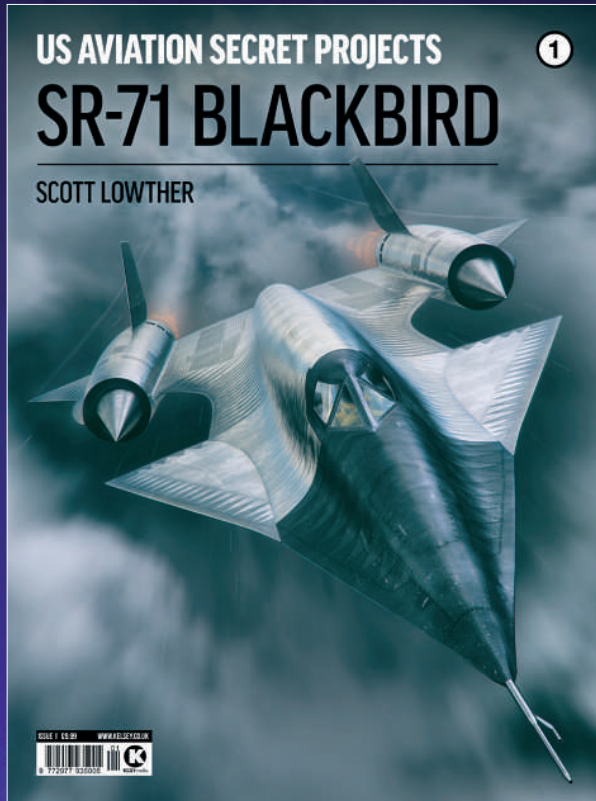
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Modern combat aircraft are able to dominate the battlefield as never before – applying overwhelming force to limit, deny and destroy their adversaries. The Air Power series profiles the world's most capable air combat platforms from the last years of the Cold War right up to the present day. Covering the strategic might of the Boeing B-52 Stratofortress, the remarkable stealth capabilities of the multirole Lockheed F-35 Lightning II, the air superiority prowess of the McDonnell Douglas/Boeing F-15 Eagle and Lockheed F-22 Raptor and much more, Air Power focuses on aircraft able to carry out their mission against even the most capable and hostile opponents. The best photography, colour illustrations and graphics all help to tell the tale of these incredible aircraft and the people who build, fly and maintain them. Operational histories of aircraft, pilots and units active during the conflicts in Iraq, Afghanistan, Syria and Yemen are reviewed and explained in detail. Air Power is a collectable series that delivers compelling and informative accounts of technologically advanced military aircraft, their weapons, their equipment, their capabilities, their employment in active service and their impact on international events. It's a must-read for anyone who loves modern aircraft and follows the ongoing global contest for true aerial superiority.

Classic Warplanes bookazine series

Devoted to the world's greatest flying machines, the Classic Warplanes series celebrates legendary aircraft from the beginning of the Cold War right up to the spectacular innovations of the present day. Every issue, published quarterly, tells the complete story of an aerospace legend such as the rugged multirole McDonnell Douglas F-4 Phantom II fighter, the magnificent Avro Vulcan bomber or the innovative cannon-armed scourge of MiG Alley – the North American F-86 Sabre. The origin of each type is fully explored, including the designers and engineers whose meticulous and painstaking work brought them to life. Prototypes and early testing, entry into service and operational careers are all examined and explained in authoritative detail. Period and modern photography, colour illustrations and graphics all help to tell the tale of these incredible aircraft and the people who designed, built, flew and maintained them. And what's more, lesser-known features and unusual missions are highlighted and discussed too, to give a fully rounded account of exactly what made these outstanding machines so special – ensuring their status as true classics. Compelling, informative and collectable, the Classic Warplanes series is a must-read for anyone who loves aircraft and aviation.

US Aviation Secret Projects



US Aviation Secret Projects bookazine series

Behind every world-famous American aircraft – from the cutting-edge Lockheed F-22 Raptor to the long-serving Boeing B-52 Stratofortress – there exists a secret history of aircraft designs that were planned but never built. For every Rockwell B-1 Lancer or General Dynamics F-16 Fighting Falcon that has entered production there have been dozens, perhaps even hundreds, of concepts; evolutionary steps which saw the final design gradually growing and taking shape on the

designers' drawing boards. In the US Aviation Secret Projects series, American aerospace engineer and aircraft development specialist Scott Lowther looks in detail at the vast range of different variants and configurations proposed for some of the United States' most innovative and advanced aircraft. Each issue is fully illustrated throughout with scale diagrams showing the many different designs studied, with dimensions and technical information provided where known.

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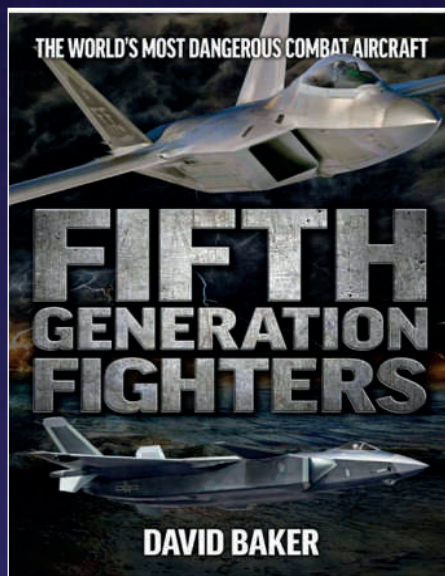
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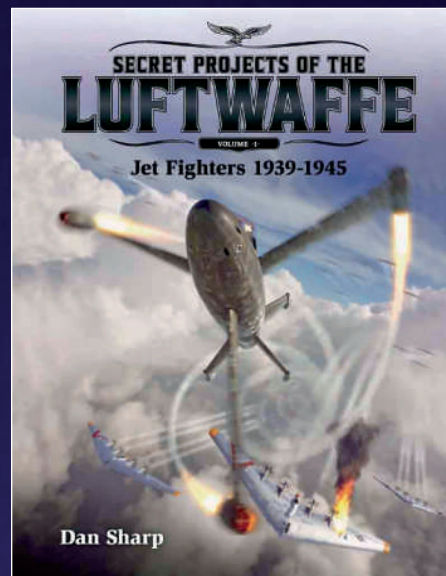
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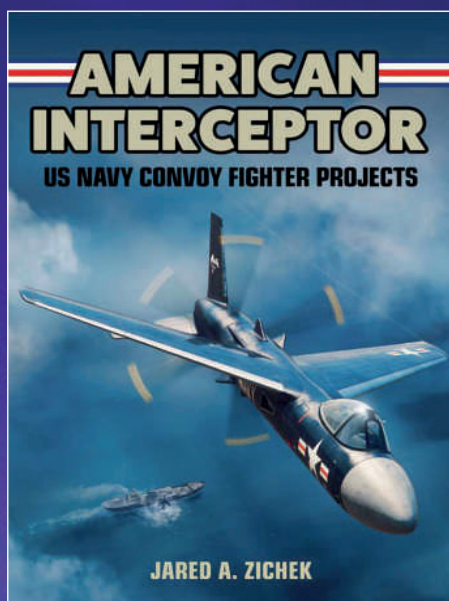
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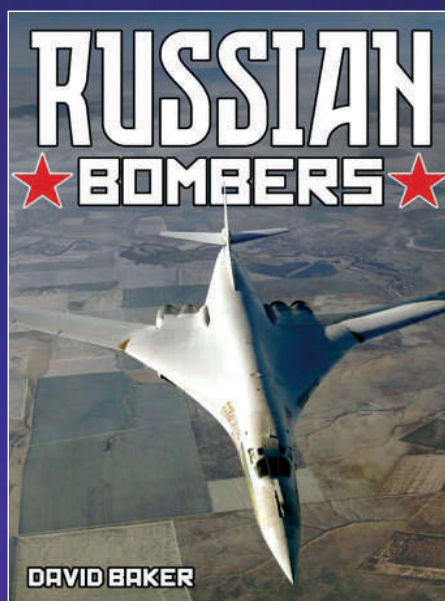
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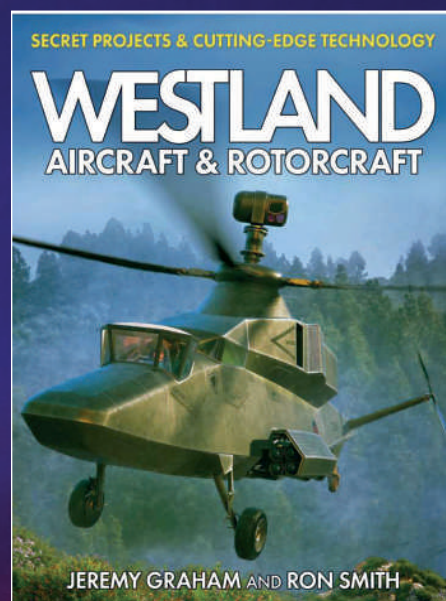
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A comprehensive history of Soviet and Russian bombers – from reverse-engineered B-29s to modernised Tu-95s, Tu-22Ms and the supersonic Tu-160 – tracing how these aircraft evolved into powerful tools of strategy, engineering, and global influence.

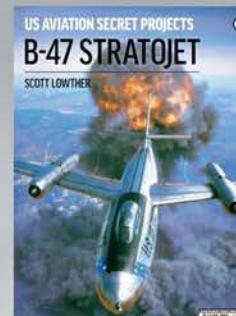
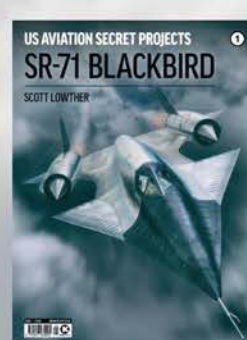


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